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COST ACCOUNTING

THEORY AND PRACTICE

BY

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PREFACE

Considering the number of books that have been written on cost accounting within the last four or five years, it may be appropriate to give some reason for adding another to the fast-increasing list.

In this volume the author's main purpose is:

(1) To provide for the public accountant and cost accountant a reference book dealing in a direct manner with the practical parts of cost accounting.

(2) To present the principles and methods of cost accounting in a simple and direct manner, so that the student may be able to grasp them quickly, unhampered by dissertations on organization, efficiency and the importance of cost accounting generally.

(3) To furnish the manufacturer with a work containing all the important practical points in connection with cost accounting, summarized and briefly explained.

It is not the author's intention to present this work as a reference book dealing with factory organization and efficiency methods, or to undertake to present all that might be said on the subject of costs. On the contrary, while omitting no cost details of importance, it has been his aim to reduce to a minimum, so far as language is concerned, the explanations and descriptions essential to a clear presentation of the workings of cost accounting.

The author takes pleasure in acknowledging his indebtedness to Mr. John F. D. Rohrbach, C.P.A., New York, for

the preparation of the four system charts in this book, and to Mr. Newman D. Waffle, M.A., for carefully reading and criticizing the manuscript.

J. Lee Nicholson.

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COST ACCOUNTING

Theory and Practice

CHAPTER I

COST FINDING AND ITS FUNCTIONS

The importance of efficiency in business organization has never been so generally recognized as at the present time, and the subject presents an even greater field for development in the future. One indication of this is the increased volume of literature that is now available on the subject. More than 90% of this literature has been published in the last decade, and fully 75% in the last five years.

The ultimate causes of this are to be found in the broad field of economics. The gradual absorption and development of natural resources, the exploitation of new fields of commerce, the increase of population, the higher standards of living and greater complexities of demands in modern life—these are but a few of the innumerable influences reflected in the industrial life of today.

Transformed to some extent, these changes meet the manufacturer in the form of demands for more wages and better labor conditions, in the increased cost of materials,

and in a much keener competition in every phase of manufacturing and selling his product. He must either adapt his methods to meet the situation, or retire from the field.

Only one practicable road lies before him, and that is a keener realization of the existing possibilities in his business. To be specific, he must eliminate waste of every kind, and plan his organization so as to increase the production per unit of cost, which is another way of saying he must introduce efficiency methods.

Various Phases of Efficiency Progress

This search for efficiency appears in many phases which overlap each other, more or less. From the mechanical standpoint, it involves a study of plant location and construction, new and better types of machines, economies in producing and using power, etc. From the labor standpoint, it has given rise to new and improved methods of wage payment, such as the differential rate plan and the premium and bonus methods with their various modifications, all of which offer increased pay for greater individual effort and efficiency. Even the motions and positions of the workmen are being analyzed into their component parts, with the view of eliminating those unessential to the process in hand. While some of these methods are still novelties, yet the time is not far distant when most manufacturers will have to do something of this kind for their own salvation.

From the standpoint of factory organization, more has been attempted and accomplished, because the need has been pressing and immediate. The purpose here is to bring the activities of the whole plant, no matter how widespread, under the direct review and control of the management. It is felt, and rightly so, that a considerable loss is incurred unless efficient systems and reliable statistics enable the management to keep in touch with the various steps of

production, and to locate the responsibility for waste, lost time, shop errors, etc.

Quite as essential in its bearing on efficiency is the process of cost finding; that is, finding just what it costs to manufacture a certain order or article. Not only is this necessary to determine possible selling prices, but it provides the ultimate measure by which manufacturing methods may be compared, and the best selected.

General Functions of Cost Accounting

While the present book treats primarily of cost accounting, it would be a mistake if its scope were limited to finding costs only. Any good cost system, properly operated, performs two distinct, though related, functions.

The first, which may be called the direct function, is that of ascertaining actual costs.

The second, or indirect function, is that of supplying, in its system of reports, the information necessary to organize the many departments of a factory into working units, and to direct their activities in accord with some definite plan.

Cost Accounting as Related to General Accounting

Cost accounting, as a science, is a branch of general accounting. Its province is to analyze and record the cost of the various items of material, labor and indirect expense incurred in the operation of a factory, and to so compile these elements as to show the total production cost of a particular piece of work.

With the cost books once established, the best modern usage is to incorporate their record in total in the general financial books. In this way the modern cost system builds up an interlocking series of accounts which furnish the material for a detailed study of the operations of a manufacturing business.

The accounts which appear in the cost books, however, differ in nature and scope from those in the general financial books. The latter exhibit the complete record of the financial and commercial transactions of the company, whereas the former treat only of those transactions which deal with, and are properly chargeable to, the manufacture of the product. Like the general books, the cost records show the amounts spent for material, supplies, labor and indirect expenses; but in addition there appear accounts with the various operating departments, classifications of the product, part-finished stock, etc. It is these latter accounts that make an analysis of costs possible.

Functions of a Cost System

The functions performed by a cost system with respect to increasing the efficiency of a plant from an organization standpoint may be noted under the following heads:

(1) The records provide for a perpetual inventory, and also for the preparation of monthly statements showing the industrial and financial condition of a company.

(2) The cost of each article or class of product being separately shown, the management has invaluable data at hand to guide it in making changes of policy or methods.

(3) Comparative costs for different periods and under different conditions are obtainable.

(4) The records provide for following the material from the raw state until it is finished product, and for ascertaining the time, labor and expense involved in its manufacture. In this way losses of material, wasted time, defective work, poor foremanship, and various other "'leaks" are detected.

(5) A cost system supplies the information necessary to standardize the work of a plant.

The five items above mentioned are not to be regarded as

a brief for the value of cost systems, but rather as an analysis showing the lines along which a cost system influences the factory organization.

Application of Cost Principles

The principles underlying cost finding have all been analyzed and defined; but when it comes to the actual installation of cost accounts, the greatest skill and caution must be observed in applying these principles to the conditions that exist. No two manufacturing plants are alike, not even in the same line of business. Every plant has peculiarities that bear upon the methods of cost finding; and this makes each factory a problem in itself. It follows that in either writing or reading a treatise on the subject, this distinction should be clearly conceived. The knowledge of principles, without a corresponding familiarity with the facts and conditions of manufacturing, produces the theoretical cost finder, who is apt to be a nuisance. On the other hand, it is only the shallow thinker who trusts to a superficial study of forms and accounting practices, with the idea that such knowledge prepares him to go into any business and install a cost system. To attain success in cost work, one must see and understand the application of the principles to the conditions which actually exist.

CHAPTER II

ELEMENTS OF COSTS

Production costs are classified into three principal divisions, known as the elements of costs:

(1) Material
(2) Labor
(3) Expense

These may be subdivided into:

(1) Material { Direct / Indirect

(2) Labor { Direct or productive / Indirect or non-productive

(3) Expense { Direct / Indirect

Direct Charges

"Direct Charges" is that element of cost that enters into, and can be charged directly to, the product.

The cost of the substance out of which the product is made is the direct material charge; the cost of the labor applied directly to the productive process is the direct labor charge; and any other expense that can be charged directly to an order, job or process may be included as a direct

charge under the caption "Direct Expense." The expense of workmen in traveling to and from a job, as well as their hotel expenses while engaged out of town on a particular job, are examples of direct expenses.

Direct expense, while an important factor of cost in some lines of business, rarely enters into the cost calculations of ordinary manufacturing, and is disregarded in the present volume.

Indirect Charges

Indirect material consists of such material as factory supplies, which, while used in processes, either does not enter into the product itself, or else enters in such a way as not to be chargeable conveniently to any particular article.

Indirect or non-productive labor is that used in repairing, handling, supervision, etc.—in short, any labor not expended directly on the article or process itself.

Indirect expense as used here refers only to those expenses incurred in the manufacturing end of the business which are properly a part of the cost of production; *e.g.*, supervision, repairs, light, power, depreciation, etc.

Indirect Expense

All expenses and charges other than direct charges come under the general head of "Indirect Expense." This includes indirect material and indirect labor, as well as the more closely delimited "indirect expense" of the preceding section. Indirect expense is often known as "Burden" or "Overhead."

Indirect expenses, as a class, fall into two divisions, depending upon how they are to be apportioned or distributed in costs. The first division consists of those expenses that can be apportioned to individual products or certain processes, because they are incurred in particular

departments of the factory, while the second is made up of expenses which extend over the plant as a whole and must be distributed over the products as a whole, and which are therefore designated as general operating expenses.

Items Composing the Indirect Expenses

The following list shows some of the more constant items which compose the indirect expenses. The classification will vary in almost every factory, but the items listed almost invariably appear.

Indirect material	Taxes
Oil	Insurance
Supplies	Interest
Freight and express inward, when not charges to direct material cost	Depreciation
	Maintenance
	Repairs
Indirect labor	Power or power plant
Supervision	Light
Inspection	Heat
Experimental work	Small tools
Rent	Over, short and damage

Rent, Taxes and Insurance

When rent is paid, it is generally distributed over the different departments on the basis of floor space occupied.

Taxes are a part of the general operating expenses, as they are independent of department value.

Insurance, on the other hand, is partly distributed over the plant as a whole, and partly over each department according to its value.

Depreciation, Maintenance and Repairs

Depreciation, maintenance and repairs are distributed

between the plant as a whole and its departments, depending on where the expenses are incurred.

The loss of value due to depreciation is undoubtedly the most difficult of all expenses to reduce to accurate figures, because there are so many elements to be taken into consideration. For instance, the general nature of the equipment, the length of service to be expected, the amount of use per day or month, the kind of business, the amount spent for maintenance and repairs, and the likelihood of new methods and machinery, are a few of the more important influences that determine the actual amount.

The discussion of depreciation, as a whole, must be left to special books on that subject. The province of the present volume extends only to the manner of its treatment in cost finding; and here depreciation is usually disposed of by distributing the cost of the equipment of a plant over the product it turns out during a period of time estimated as the life of the equipment.

There are two general ways of arriving at the entries for depreciation:

(1) Periodical revaluation of all the property, the difference between any two consecutive valuations representing the depreciation for the period. This would seem to be the most accurate plan; but practice has shown that such revaluation is at best an estimate, which must be based on two factors, condition and earning power. The gain in accuracy, if any, is not enough to justify the difficulty and trouble of the physical revaluation, except at long intervals.

(2) A more common method is to estimate the life of a machine or building, and then write off a certain per cent of its value each year.

Two cautions in particular must be observed in writing off valuations by the per cent method. First, the estimates should be reviewed at intervals, and corrections made for

apparent errors. In case of doubt as to the proper rate, it is considered better policy to choose the higher of the rates considered, as any mistake is better corrected by restoring values where they belong than by charging the Profit and Loss account.

The second caution relates to the ground covered by single calculations of depreciation. The same per cent must not be extended to cover complex groups. If a single per cent were used on the whole plant, the result would be quite untrustworthy, since the true rate of depreciation varies in different parts, depending on the nature and cost of machines, amount of idle time, and other conditions. To be accurate, each element of equipment should have its own depreciation rate.

Power Costs

The power costs are somewhat complex, especially where a factory produces its own power. The power plant is regarded as a department by itself, and bears its own assignment of direct, as well as certain indirect, expenses. If the power plant furnishes heat and light to the factory, the cost of these items must be subtracted from the total power cost, to get the net power cost applying to production centers. To obtain accuracy, it is generally necessary to segregate and distribute the power costs as a direct charge to each department or machine. The net power cost is usually distributed in the ratio of use, thus making each machine or department bear its share of unutilized power, or power lost in transmission.

The calculation of the power actually consumed by any machine or department is a mechanical problem. There are special machines for the purpose, such as dynamometers for steam-driven machinery, and wattmeters or power factor indicators for machines using electricity.

Small Tools

The value to be set on tools made in the plant should include all the elements of cost that enter into their manufacture. It may be stated as a general principle that the cost of any equipment manufactured by the plant itself must include its share of the indirect expenses as well as the labor and material cost. For the same reason, installation charges would be treated as a part of the cost of a machine.

If special dies or tools are bought or made for a particular order, the total cost is charged against that order, unless they are retained after its completion, and an allowance made, either on their scrap value, or on the possibility of their being of some future use.

Experimental Work

When the expenses of the experimental department arise from work directed on the current product, the cost becomes properly an item of indirect expense; but when the expense results from work on products or processes that are to be used at a future time, the correct method is to make a deferred charge of it, which will not be absorbed until the results of the experimental work are in actual operation. In practice, however, such expenses are usually absorbed in current indirect expense, and are not treated as deferred charges unless they are large enough to affect the cost calculations perceptibly.

Machines and appliances that are perfected through experiment do not come under the same head, but should be considered as assets, their theoretical value being the sum of all the elements of cost that have been incurred on their behalf during the course of the experiments.

Over, Short and Damage

Wastes of material, shrinkage in weight, defective work, etc., are charged to Over, Short and Damage account. After this account has been credited with the value received for any disposition of the items charged, the balance becomes a part of the indirect expenses.

Interest*

Interest, as an expense, is generally treated according to its origin, as follows:

(1) Interest on mortgages, as a part of the rent charge.

(2) Interest on buildings and land values, as one of the general operating expenses.

(3) Interest on the value of different machines or equipment of different manufacturing departments, as a charge to the product of these machines or departments.

Production Costs and Selling Costs

A clear distinction must be made between production costs and selling costs. The latter include the selling expenses, such as advertising, commissions, salaries, etc., which are necessary elements in determining the price for which an article may sell, but have no direct bearing on the cost of producing the article itself. The cost of production ends when the finished stock is ready for sale.

Administrative Expenses

The expenses that arise from advertising, commissions, salaries of officers, etc., are known as commercial, or selling and administrative expenses.

*See Chapter III, "Interest in Its Relation to Cost."

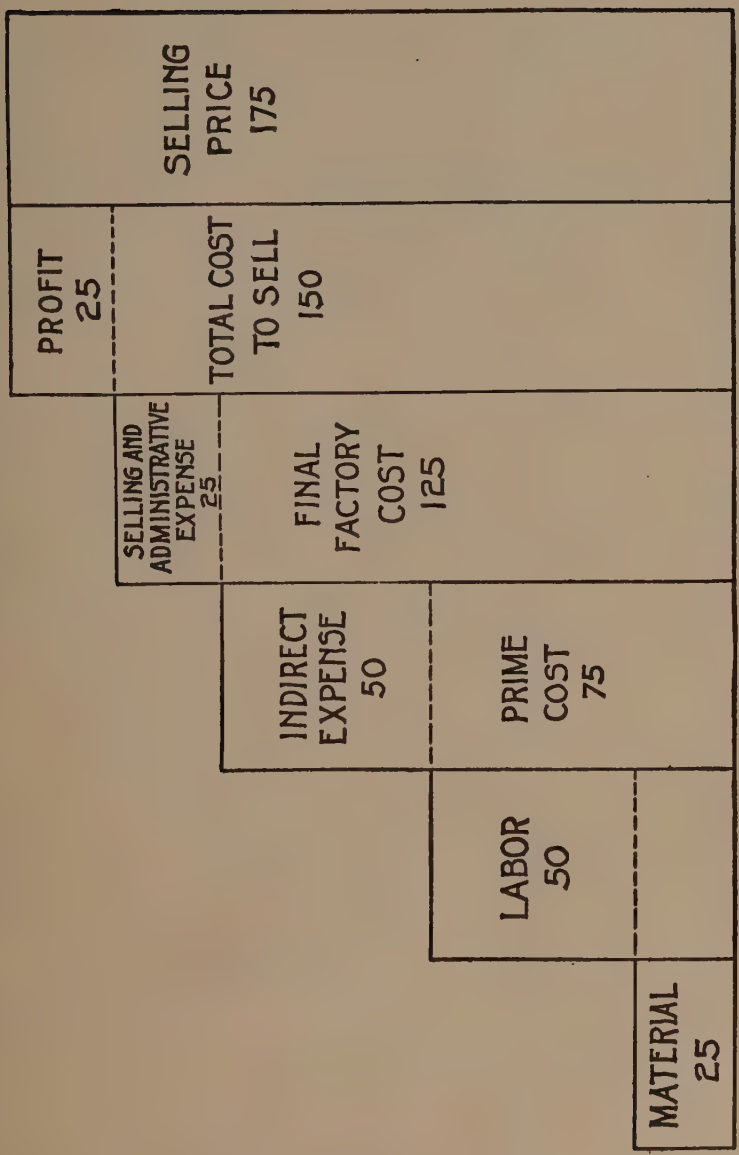

Diagram Showing Relation of Cost Elements to Selling Price.

The segregation of administrative expenses, as a distinct class, is sometimes a matter of convenience. In the majority of cases the time of the administrative force is spent in supervising the selling organization, in solving problems of production, and in looking after the finances of the business. Therefore, administrative expense is partly a production cost, and partly a selling cost. The purposes of cost finding are best served by separating expenses of such a nature from those expenses which arise from production proper and its direct supervision.

Relation of Cost Elements to Selling Price

The sum of the direct material and labor cost is known as the "Prime Cost." This, combined with the indirect expenses, gives the final "Factory Cost." The total of the selling and administrative expenses, plus the factory cost, shows the cost of making and marketing the article; and this total—plus the profit—gives the actual selling price.

This relation of the different elements may be illustrated by the diagram on the preceding page, which, in the light of what has been said, is self-explanatory.

CHAPTER III

INTEREST IN ITS RELATION TO COST

Should Interest be Included in Cost?

As there is a difference of opinion among accountants as to treating interest as a cost of production, the views of two writers of prominence are quoted at length in the present chapter, and reference is made to a number of articles on this subject. The question is of great importance, and therefore the views set forth in this chapter should be considered carefully, and the articles referred to should also be consulted before a final decision is made.

The author's own position is that whatever expense is necessary to operate a plant must be charged against the cost of the product, if true costs are to be obtained; and as it is just as necessary to have buildings, grounds and machinery as it is to have workmen for manufacturing a product, these factors should be considered in ascertaining costs, especially where the values of these elements vary in relation to different articles manufactured.

To make this clear, suppose that a factory is producing several articles of different kinds, some of which necessitate the use of expensive machinery or equipment, while others are largely the product of hand labor, or cheap machinery. If the different values invested are not taken into consideration, the indirect expenses as distributed will not show the true variation that exists in the costs. The unequal burden, resulting from the differ-

ences in investment, is clearly an essential factor; and since this burden is a direct result of using the producing equipment, it seems that it should be considered as one of the elements of cost.

Of course, if the equipment is uniform, or if all the output passes alike through all the processes, there is no essential difference between including the interest as a cost and leaving it for a later supplementary calculation. Since, however, in either case, the amount invested must be considered in determining the selling price, the question still remains as to what method or base of calculation should be used. It may be interest on values, or some arbitrary charge based on time or other conditions of manufacturing.

The difference of opinion then centers on what is the best method of applying this charge to the cost; that is, whether it should be included among the regular cost items and become a part of the accounting system, or only be added to the cost in a statistical report.

From another standpoint the objection is raised against including interest cost as a part of the accounting system, that banks in many cases will not accept the valuation of an inventory which includes interest as part of the cost of the product.

Interest as a Charge against Costs

The following article on "Interest on Investment in Equipment,"* by William Morse Cole, Assistant Professor of Accounting in Harvard University, presents the view that interest is properly a cost item, and should be so treated:

Though it is common to speak of cost accounting as if it were different in nature from other kinds of ac-

*"Journal of Accountancy," April, 1913.

counting, virtually all accounting worthy of the name has for a prime purpose the determination of cost. Accounting should serve as a guide in three ways: In fixing prices so that they shall be adjusted properly to costs; in eliminating waste of material, of labor, and of burden charges; and in determining what had best be undertaken in the establishment itself and what had best be purchased or ordered outside. Since these three purposes are the recognized fundamental purposes of cost accounting, it is necessarily true that whether an enterprise is concerned with manufacturing, distribution, or service, its accounting should be, in a sense, cost accounting.

Let us examine these three aims in turn.

Prices must be fixed at such a point that they shall at least cover (1) materials, or goods; (2) labor, or service, and (3) expense burden, or what are commonly called "Overhead Charges." Obviously, if the last of these is not quite fully covered, the continuance of production or service is not economically advisable (unless, of course, the work serves other purposes than those which are immediately connected with the initial enterprise). If, again, the income provided by the price gives less than a proper amount as interest on the investment—investment in the form of capital locked up in machinery, facilities, material, or waiting product—the return is not economically sufficient to make the enterprise self-supporting. If this interest is not included in the expense burden, therefore, it must be added later, somewhere, before one can know whether the return is adequate to make the enterprise self-supporting. Since one of the purposes of accounting is to show whether the return is adequate, the interest would seem necessarily to be involved somewhere in the accounting.

Efficient management always attempts to eliminate as

much as possible of excess consumption of material, excess expenditure of labor—both mental and muscular—and excess investment in machinery, in other facilities, and in supplies. The best guide for such elimination is an analysis of these various elements, so that comparison may be made between different methods and between different managements. To use a simple illustration, there may be a choice between two methods as follows: Machinery at a cost of $35,000, materials at a cost of $5, and labor at a cost of $20; or machinery at a cost of $5,000, material at $5, and labor at $30. We may know, perhaps, that the maintenance, insurance, and taxes on the machinery while the article is in machine process (that is, the share of maintenance, insurance, and taxes chargeable on this particular production) will be $10 in the first case, and $1.50 in the second case. These figures give us with the expensive machinery a production-cost of $35.00 (that is, $5 for material, $20 for labor, and $10 for maintenance, etc.), and of $36.50 ($5 for material, $30 for labor, and $1.50 for maintenance, etc.) with the less expensive machinery. Taking no account of the interest, therefore, the investment in the expensive machinery appears worth while—if, at least, our production is so large that a margin of $1.50 reduction in cost on each article of product is worth while when set against the possibly greater error in our estimate of depreciation, etc. Yet we have clearly left out of account one element of the problem, for until we know the length of time for which these different equipments are involved in production, we do not know whether interest on the greater capital in the first case will more than eat up the margin of saving over the second. If, for example, the machinery is employed a day in producing this article, even though we use as low a rate of interest as 3 per cent, there is in the

expensive machinery an additional element of $3.50 in interest for the one day involved (on a 300-day basis), but there is an additional charge of only 50 cents in interest, on the same ground, for the inexpensive machinery. This difference in favor of the less expensive machinery turns the scale of advantage; for the costs are now $38.50 compared with $37. If, on the other hand, the machines were employed in this production only one hour, on the basis of a 9-hour day, the more expensive machinery with the lower labor cost would be a more economical means of production; for since the interest element is now only 39 cents, its total is $35.39, but the total for the other machine, with interest of 6 cents, is $36.56. It is absolutely essential, therefore, that interest be taken into consideration in determining which of two methods of production is more economical.

The same sort of consideration of interest is essential in attempting to determine what we shall make in our own establishment and what we shall order outside; for if work at home involves investment in machinery, or other facilities, so that we must get a return of $38.50 from our ultimate product or service, but we can purchase the same product or service outside for $37, it is obviously foolish to do the work at home—unless, indeed, our freedom from outside dependence is worth to us more than the difference in cost, or unless we can find no employment for our capital elsewhere at a rate as high as that which we have used in our calculation.

No comparison is possible between different establishments, between different periods in the same establishment, or between different methods in the same establishment, if capital investment in labor-saving or material-saving machinery is neglected; for the very purpose of such investment is to save cost in other directions; and to neglect

the capital sacrifice made in saving other costs, is to neglect in part the very aim of cost accounting.

Opponents of treating interest as a cost may admit the need of knowing the figure of interest, but may deny the desirability of showing it on the books. The function of an accountant is to analyze a situation and learn the facts; and the function of a bookkeeper is to record the facts, which, if not recorded, will be forgotten. It seems, therefore, as if it is the function of a cost accountant to learn regarding interest the facts which will serve as a guide in determining prices, in eliminating wastes, and in determining what may best be undertaken; for one cannot otherwise easily get a safe guidance in these particulars. It seems, too, as if it is the function of the bookkeeper to record the results of such study, for surely they will be forgotten if they are not recorded.

Possibly some persons admit that for such purposes as those just discussed, interest must be considered, but deny that it is a cost. Discussions of terminology are quite as likely to be fruitless as fruitful. Any practical value that they may have must lie in a possible better common understanding of one another's meaning when men use the terms in question. To-day the word "profit," which is the complement of "cost," is used in many senses. Under many partnership agreements, salaries and interest on investment are charged as expenses, and net profit is the gain arising from proprietorship pure and simple—from the *circumstance of responsible ownership,* aside from the salary of the manager as manager (not financially responsible) and from the income of the capitalist as capitalist (not personally responsible). The happy conjunction of ownership and personal responsibility often results in a gain not otherwise realizable; and that gain is profit. When there is no provision for interest and

salaries, on the other hand, the term "profit" is commonly applied to the difference between the gross income and the charges incurred for purchases and outsiders' (non-partners') services; so that the profit shown is a compound of return for proprietors' services, for interest on partners' investments, and for the circumstance of responsible ownership. In corporation accounting, again, salaries are always included in expenses, and the net income is the return to the stockholders as owners of capital. In common parlance, therefore, the word "profits" means much or little. Knowing this, men always interpret it with a mental foot-note.

On the announcement of the figure of profits under an agreement which makes no provision for interest, the first mental act of anyone interested in the business is to see what relation those profits bear to the capital—so as to see what are the excess profits over a reasonable return on the investment. Instinctively, interest is a first deduction—partly because it has a definite basis that can be figured, and partly because it is the one thing that everyone counts on. One does not think of terminology; one thinks only of the fact. Virtually everyone admits that in partnership or other settlements the most satisfactory agreement is one that provides for a definite interest charge. This is mere practical convenience. Though the accountant is not much concerned with theoretical economic distinctions, he is at least interested when he sees that economists use a term in a sense that happens to be, for his own practical purpose, most convenient to him. Professor F. W. Taussig, in his "Principles of Economics,"* a recently published and standard authority used in many universities, says: "So much only of a business man's income is to be regarded as profits

* Vol. II, p. 179.

as is in excess of interest on the capital which he manages."

We have seen that for analytical purposes, in studying operations, practical necessity requires us at least to consider interest in virtually all calculations when investment is involved; and we have seen that in financial statements practical convenience is served by the treatment of interest as a charge, or cost, rather than as a residue, or profit. It seems reasonable, therefore, for accountants to adopt a terminology that will serve their own ends, will agree with the terminology of economists, and will mislead no one. Business men are likely to be misled in the future, as they have been in the past, by statements of profit which assume that no cost is involved in the use of capital.

Interest a Profit—Not a Cost

The following article, entitled "The Fallacy of Including Interest and Rent as Part of Manufacturing Cost,"* by A. Lowes Dickinson, C.P.A., presents the other side of the question, viz: that all interest is fundamentally a profit and not a cost.

The fundamental objection to treating interest and rent (which, except in so far as it includes compensation for services rendered, is only a form of interest) as an integral part of the cost of manufacture is that all interest is in fact profit. The practical effects of this objection are as follows:

First, that from an accounting standpoint costs are used mainly to determine the valuation of inventories of stocks on hand and that to include interest (that is, profit) in such costs leads to inflation of these values and consequent anticipation of profits not yet earned by the sale of products.

*"Journal of Accountancy," August, 1913.

Secondly, that it is impracticable to determine a rate of interest on any but an arbitrary basis and that consequently costs arrived at on such a basis have no real meaning and may easily be misleading. For example—owners of a business are earning profits equivalent to 12% on the capital employed and decide to make certain extensions and improvements which will result in savings equivalent to 10% on their cost; they are in a position to raise the money by an issue of bonds on a $5\frac{1}{2}\%$ basis or of preferred stock on a 7% basis. What rate of interest should be added as a charge to cost accounts if such a principle is adopted?

Thirdly, that the common methods of including interest in costs calculate such interest only on buildings, plant and machinery and ignore the investment of working capital, and frequently also the element of time during which the capital facilities are required for each manufacturing operation.

Fourthly, that to include interest in costs of every operation results in concealing from those in charge of the business the exact effect of two of the important factors involved in profits—namely, the amount of capital employed and the time for which it is employed—and consequently the actual return on the investment necessary to produce it which is yielded by any particular article.

Whilst perhaps the point is not material in a discussion of the theory involved, it may be pointed out that there is a strong objection on the ground of policy to the inclusion of interest as a part of the cost, particularly in the case of public service corporations. In fact, this objection is so pronounced that some banks stipulate in agreements with borrowers that inventories must be taken upon a basis that excludes interest on capital invested.

If any interest rate is to be assumed it can only be a rate which represents a fair compensation for the use of the capi-

tal. If the selling price or rate yields a profit over and above the cost of material and labor, a fair return on the capital employed and fair compensation for management, it would seem that to the extent of this profit the price charged is excessive, at least where the manufacture is not conducted under some patent or other special process for which a further compensation may fairly be exacted. This is not a conclusion that a manufacturing or public service corporation whose prices or rates are attacked can afford to admit, more especially as those attacking the rates are not bound by the interest rate adopted, as the corporation might be.

While, however, so far as the general accounts of a business are concerned, it must be held that interest is not a proper element in the cost of product, there is an undoubted demand, and even necessity, for some supplementary statistical accounting which will give effect to the principal elements involved in the earning of profits. The factors involved in profits are the following:

(1) The labor, material and expense cost of a unit of each class of article.

(2) Facilities used in manufacture, such as land, buildings, machinery, tools, stocks on hand, and other working capital, all segregated between the different classes of articles.

(3) The time during which such facilities are in use for a unit of each class.

(4) The selling price of each unit of each class.

If these elements be known, comparisons can be made between different articles produced in the same factory or between the same articles produced in different factories, as to the amount of fixed capital employed in different processes and the time for which it is employed; as to the

amount of working capital constantly maintained and used; and as to the effect of further expenditures on additions and improvements with a view to cheapening cost of production. Only the first of the above four factors should enter into the general accounting books and form the basis of inventory valuations and so of the actual profits earned; the remaining factors should be dealt with only in subsidiary statistical records. The difference between the sum of all selling prices (4) and of all costs (1) will agree with the gross profit in the accounting books; and a comparison of this figure with the total capital employed, including not only fixed but circulating capital necessary for manufacturing purposes, will give the rate of return yielded by all classes of articles. The cause of any variation in this rate of return, as compared with a previous period, or of the varying rates of return on different articles in the same factory, or of the same articles in different factories, will be obtained from the detail figures. Such variations may be due either to (1) higher or lower cost of labor, material and expense; (2) greater or smaller amount of facilities used; (3) longer or shorter time during which these facilities are used; and (4) lower or higher selling price. If interest at an arbitrary rate is included throughout in labor, material and expense costs it means that the fluctuations in profit due to the first three of these variations are merged into one and cannot without considerable labor again be segregated. The best measure of factors (2) and (3) would seem to be the value of the facilities used, multiplied by the fraction of the year during which they were used and divided by 100, which product would be equivalent to interest at 1% per annum; the actual margin between selling price and cost of labor, material and expense divided by this product would thus be the actual rate of return yielded by any particular class of articles, the average of

such yields corresponding to the yield shown by the principal accounting records.

Unused facilities would under this system appear as a factor in reducing profits either by lack of sufficient business to employ them or by excess facilities in one portion of the plant as compared with another. The product factor corresponding to these unused facilities would form part of the divisor in obtaining the average yield.

Comparative costs of separate operations will be reached by a consideration not only of the actual labor, material and expense cost in different periods or in separate factories, but also by a comparison of these costs with the facilities employed. Thus the estimated savings to be effected in any operation by additional expenditures on construction account should be found reflected in the reduced cost of these operations.

Such a plan as that here suggested gives proper weight to all the factors entering into profits, without introducing any arbitrary rate of interest; it will be no more complicated in its working than are cost systems which are in constant use; and its complications will vary with the number of different articles produced for which separate costs are required.

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CHAPTER IV

PRINCIPLES AND GENERAL METHODS OF COST FINDING

Calculating Costs

The conditions of manufacture determine the basis on which costs are calculated; and according to these conditions, costs are found either (1) on the order, job or article, or (2) on the product or process, without relation to a particular order or article. The former method is known as the "Special Order System," and the latter as the "Product System."

Applying Cost Charges

There are two general methods of applying the items of cost, known as

(1) Productive labor method (hours or wages)
(2) Process method

In the first method, the labor and material are charged directly to the order, article or product, and to these charges is added a pro rata share of the indirect expenses, based upon the amount or the time of the productive labor consumed in the production of that order, article or product. This gives the total cost.

Under the second method, the charges are made against the process or operation, and after the total cost is ascertained it is distributed over the product according to its

nature—*i.e.*, on the basis of weight, measure or number, as the case may be.

Machine Cost Method

A special type of the process method, particularly valuable when it can be used, is the "Machine Cost Method," which employs the same principle, but applies it to machines or groups of machines. Its effectiveness is due to its ability to absorb many of the usual indirect expenses, such as power, heat, light, etc., as direct charges, thus lessening the amount of indirect cost that must be distributed over the product as a whole. The importance of this must not be underestimated. The direct material and labor charges are not, as a rule, difficult to compile or distribute, and can be accurately determined; but the proper distribution of indirect expense is difficult; and almost all the trouble and mistakes in finding costs are due to this fact. Any method that provides for transforming a large part of these indirect expenses into direct charges attacks the difficulty at its source.

Types of Systems

Four types of systems are founded on this double classification—*i.e.*, the special order system and the product system as bases for calculating costs, and the productive labor method and process method for applying costs. These typical systems may be designated as follows:

(1) Special order system, using the productive labor method.

(2) Special order system, using process or machine cost method.

(3) Product system, using the productive labor method.

(4) Product system, using process or machine cost method.

Cost finding for most phases of manufacturing may be effectively served by one of these four types; but in actual practice it is common to utilize the features of two or more of them in finding the costs in different parts of a plant. Each type is susceptible of more or less modification to fit special conditions, while still retaining its general characteristics. The success or failure of a cost system sometimes largely depends on the recognition of these special conditions, and the proper adaptation of the cost system or systems to meet their needs.

Partial or incomplete cost systems are frequently devised for particular purposes. In such cases, as a rule, the object is to find the cost of certain lines of goods as a class, without going into details for each production order or article. A partial system of this kind is described in Chapter XIII.

There are also in use systems or methods of *estimating* costs and of verifying these estimates to a certain degree of accuracy. These are not cost systems in the true sense of the word, as they do not provide for finding actual costs; but, nevertheless, they may be of considerable practical value in small shops. In larger factories they often serve to indicate where accurate cost methods should be installed. These methods are described under the head of "Estimating Cost Systems" in Chapter XII.

Analysis of Operations

Since one of the principal functions of a cost system is to analyze the costs into their component parts, it follows that there must be a corresponding analysis of the manufacturing operations. This is accomplished by dividing the

factory more or less arbitrarily into operating departments or production centers, the aim being to limit each department, as far as possible, to simple and uniform operations.

The operating department plays a very important part in making up and arranging the cost accounts. It furnishes a center about which various expenses may be grouped, and from which the indirect expenses may be distributed over a limited field with a greater degree of accuracy. A distinction must be maintained between direct production departments and indirect production departments. The latter often have to carry their share of general operating expenses until the cost incurred in them is distributed as a burden on direct production.

The following list gives the operating departments of a plant manufacturing axles and springs:

Direct Production Departments

Foundry
Forge
Upsetter
Drop Forge
Blacksmith
Welding
Turning
Heavy Axle
Axle Box
Axle Nut
Threading
Light Axle Finishing
Commercial Assembly
Pleasure Auto
Pleasure Auto Assembly
Auto Parts
Chassis Assembly

Indirect Production Departments

Plant
Power
Supervision and Inspection
Engineering and Draughting
Purchasing and Stores
Time and Cost
Pattern
Axle Tool
Die Sinking
Auto Parts Tool
Yard and Local Transport

Accounts are kept for each department, and these should show the cost for material and labor and the indirect expense involved in its operations.

Material Costs

The cost of direct material is a matter of market price at the time of purchase, plus the freight and yard charges when these are included in the cost. Sometimes the raw material is purchased in bulk, and has to be sorted and re-valued according to grade, as in the case of feathers, tobacco, or wool in the grease. The material cost must then be adjusted over the various grades, so as to equal the original price.

Complications sometimes arise in the treatment of scrap material used in making by-products. The custom is to determine the per cent of the original material so used, and consider its cost as the material cost of the by-product, this being deducted from the cost of the primary product. If, however, there is no way of determining the percentage of the waste used, except at considerable expense, or if it varies greatly in quantity and quality, its scrap value is

estimated; and when the by-product is sold, the amount received for it is usually entered under the head of sundry income. When this last method is used no deduction is made from the material cost for scrap value.

Labor Costs

The direct labor cost is often easier to determine than the direct cost of material. In piece-work it is given directly on the product without further calculation, unless the several costs of the parts are to be added to find the cost of the whole. In time methods of payment it is only necessary to show how much time each workman has put on the product, and the value of that time in wages paid.

There are, however, in a few lines of manufacturing, conditions where a workman may spend only from three to five minutes on a single order or article. In such cases it is not practicable to charge this direct labor specifically to the individual order or article, and a plan must be arranged for its distribution over the number of articles worked on during a given time. In other words, the principle of the process plan must be used for this particular class of labor.

In such cases an estimate of the cost involved in an operation or process is quite often made, based on previous experience or tests; and these figures are then used as a basis for applying the direct costs. If the conditions remain exactly the same, the results may be fairly accurate.

Distribution of Indirect Expenses

The ideal cost system would make all indirect expense apply to the related product in the same way as the direct costs. This, however, is hardly ever possible. The practical or working ideal is to assign as many of the indirect expenses as possible directly to the product to which they relate, and so reduce the general indirect expenses to a

minimum. There is a close relation between the amount of unassigned or general indirect expense and the accuracy of the costs obtained.

The machine cost method was commended specifically on this ground,* its principle being to gather all the expenses possible "at the point of the tool," where they are easily applied to the product operated on. The value of the operating department as a similar agent has also been pointed out, the idea there being to gather such indirect expenses as pertained to any department, and distribute them over its own particular output.

However, when the best has been done, there is necessarily a residue of expense that cannot be conceived of as applying to any particular part of production. This is sometimes distributed over the product as a whole, but the best method is to distribute it first over the departments as units, and then to have each department distribute its share in its own way.

The method frequently followed, of distributing the indirect expense over the whole production by adding a certain percentage to the prime cost, implies the fixing of an accurate rate, and is subject to very grave criticism unless the output of the factory is unusually uniform both as to nature and quantity. Ordinarily the indirect expense is not the same for each class of article, as each involves differences in process peculiar to itself; and this throws the method out of adjustment. The fault is very marked when certain articles pass through only a few departments, while others have to go through the whole, or nearly the whole, routine. The former then have to help bear the indirect expenses of several departments in which they have never been at all, while the latter are relieved of a burden that properly applies to them. A manufacturer may easily be

*Page 47.

led into fatal errors of policy by depending upon costs so obtained.

Even at its best, this percentage plan does not provide for an analysis of costs; and the organization and efficiency value of more accurate expense distribution is given up entirely for the sake of simplicity. It must be remembered that each department has its own equipment, and possibly differs from the other departments in capital invested, floor space, power used, etc. Therefore, any method which does not utilize this natural center for collecting and distributing expenses, fails to use its most efficient weapon.

Supposing the departmental method to have been adopted, there still remains the most vexatious problem of all—upon what basis shall the indirect expenses be distributed within the department so as to charge each order or article with the portion that properly belongs to it? To illustrate, let us suppose that high-priced and low-priced men work side by side, or that there are machines of very different size and value operated by men who draw the same wages, or that the operations involve about equal parts of machine work and work by hand—all of which are quite ordinary conditions. Shall the basis of expense distribution be the cost of labor or the time spent on the work? Does the cost of material enter in as a factor? Is a machine rate possible or practical? If so, just what ground can it cover? These are some of the questions which must be answered, and answered correctly, if the cost results are to be accurate.

No one method of distributing indirect expense can be considered as orthodox for all cases. Everything depends on the particular existing conditions. The purpose here is to describe the standard methods, stating their underlying principles, and indicating the conditions where each is effective.

CHAPTER V

METHODS OF DISTRIBUTING INDIRECT EXPENSES

There are seven methods of distributing indirect expenses which may be considered as more or less standard. A study of methods found elsewhere under other names will show that they are more or less modifications or combinations of these seven. It is suggested that under some circumstances one of these methods may be found valuable to distribute the general operating expenses over the departments, while another method may be used more advantageously in the department itself to apply the expense to the product.

The methods are:

(1) Direct Labor Cost
(2) Direct Labor Hours
(3) Direct Labor and Material Cost
(4) New Pay Rate
(5) Old Machine Rate
(6) New Machine Rate
(7) Fixed Machine Rate

(1) Direct Labor Cost

This method is based on the principle that indirect expenses are incurred in proportion to the amount of labor involved, this amount being measured by the labor cost.

To operate the plan, the total cost of direct labor charged to the product for a definite period is ascertained, together with the total indirect expenses for the same period. The total indirect expense is divided by the total labor cost; and this shows what per cent the indirect expense is of the total productive labor. The amount of indirect expense assigned to any article is then found by multiplying the labor cost of the article by the rate. Adding the amount of the indirect expenses to the prime cost gives the total or factory cost. The same principle applies in finding the factory cost of any job, production order, or process.

To illustrate, suppose that the pay-rolls for a certain cost period show payments of $16,000 for direct labor, and that the indirect expenses for the same period are $14,000. These indirect expenses are 87½ per cent of the direct labor cost. Now, if a man worked on an article 5 hours at 32 cents an hour, and the cost of material was 60 cents, the total cost would be $0.60, plus $1.60, plus 87½ per cent of $1.60, or $3.60.

The simplicity of this method is a great point in its favor, but at the same time offers a temptation to employ the method too widely. The point to consider is how far the particular conditions are in accord with the principle of the method. To fit the case perfectly, the labor should be the dominant element in the manufacturing process, and there should be a marked uniformity as to product, wages, and time of operation. These conditions rarely exist throughout a factory, but are not uncommon in single departments. The limits within which the method may be advantageously applied are therefore fairly well defined.

When the direct labor method is employed, special care must be exercised, if there are machines, to see that

they are uniform as to cost and running expenses, or, if not, that there is a corresponding difference between the wages paid to the operators. The method is less accurate, and even misleading, if these uniformities do not exist. For instance, if a low-priced man is operating an expensive automatic machine, and a high-priced man is working at a cheap machine where skill amounts to more than running expense, the charges for indirect expense will not only be inaccurate, but will be actually reversed.

When the residue of unabsorbed general operating expenses is small, the direct labor method is often used to prorate it over the departments, first, because the data on which to base the distribution are easily obtained, and second, because any resulting errors, when divided up over all the output of all the departments, will hardly be appreciable. Only an examination of the circumstances in the case can determine whether theoretical accuracy may be safely put aside for the sake of practical results.

(2) Direct Labor Hours

The principle of this method is the same as that just described, except that the amount of labor is measured by time and not cost. That is to say, the indirect expenses of a plant are considered to be in keeping with the number of employees engaged, and the hours they work, rather than with the wages they receive.

The plan is to divide the total indirect expense for some definite period by the number of productive labor hours in that same period, in order to find the amount per hour to be added to the prime cost of the product. Using the example given before, suppose the number of working hours for direct labor to be 56,000, and the indirect expense to be $14,000 as before. $14,000 divided by 56,000 gives an indirect expense per hour of 25 cents. In pro-

ducing the single article previously discussed, the other conditions remaining the same, the total would be 60 cents for material, plus $1.60 for labor, plus 5 x 25 cents for overhead, equaling $3.45.

An analysis of the difference between the two costs will provide the best basis of comparison between the methods. The critical point is the 32 cents per hour of the labor cost in the first example. The average wage per hour found by dividing $16,000 by 56,000 is only 28 4-7 cents per hour, and therefore the output of any man whose pay is more than 28 4-7 cents per hour has to bear more of the indirect expense in the first method than in the second.

This makes it perfectly clear why "there should be a marked uniformity as to product, wages, and time of operation" in the direct labor cost method. Evidently, differences in any of these factors tend to throw the costs out of true, unless it can be shown that there are corresponding differences in the direct costs. And this has to be shown in each particular case; for there is no essential reason why, as between two men working side by side, the output of the higher-priced man should incur more indirect expense than the other. Consideration will show that, on the whole, indirect expense is more a function of time than of labor cost. If the items that make up indirect expense are examined one by one, as interest, depreciation, light, heat, power, supervision, etc., it must be seen at once that the majority, though not all of them, accumulate according to time, and have but an incidental connection with the rate of wages.

The conclusion is clear that, other conditions being equal, the labor hour method is applicable to a wider field than the labor cost method. Certain limitations remain, viz.: The labor should be a dominant factor, and,

for the most part, the product should be uniform. Where machines are used, the same precautions must be taken as in the case of direct labor cost, except that the wages of the operators may be disregarded.

(3) Direct Labor and Material Cost

Under this method of expense distribution, the cost of material is recognized as one of the factors that give rise to indirect expense. The principle and plan of operation are exactly the same as described in the direct labor cost method, if "prime cost" is substituted for "direct labor cost."

The limitations described there all apply in this case, with the additional condition that the material cost and labor cost should be nearly equal. This method is seldom found in practice, and then almost always as an averaging method, to prorate the general expenses over the whole product. In such cases it must meet the objection to that class of methods as a whole.

If the method is used out of its special field, where the necessary uniform conditions do not exist, the results are quite unreliable.

(4) New Pay Rate

The "New Pay Rate" is still another way of utilizing the principle of direct labor cost in expense distribution. It is essentially a departmental method, and is rarely used for any other purpose.

Under this plan the indirect expenses connected with any operating department are first determined; and to these is added the department's share of the general operating expenses, which is determined on any basis that seems best. Next, the percentage of expense to labor cost is determined as in the first method; but, in-

stead of this rate being added to the total labor cost, it is applied to the employee's wage per hour. For instance, if the indirect expenses were 62½ per cent of the direct labor cost, and a workman's pay was 32 cents per hour, the new pay rate as applied to the product would be 32 cents plus 62½ per cent of 32 cents, or 52 cents per hour. If the man worked five hours on any one article, that article would be charged with five times 52 cents, or $2.60 for labor and indirect expense. By adding the material cost to this, the total cost is shown.

The principle involved, and the conditions of its application, have already been sufficiently discussed under the direct labor cost method. The only advantage of the new pay rate lies in the ease with which the expenses are prorated over the product. Once the rate is determined, it is a very simple matter to apply it to every article or order.

For finding costs it is just as accurate as the direct labor cost method and no more; but as a method it fails to present the data necessary to analyze costs properly. It collects charges in totals; and, in order to attain simplicity, neglects the proper classification and arrangement. However practical it may be in some cases, this last consideration disqualifies it as a part of any complete cost system.

(5) Old Machine Rate

All machine rates are based on the principle that indirect expenses accrue according to the number of hours machines are in operation. There is considerable difference in the methods employed by the different forms of machine rate in collecting and applying the charges to the product. The simplest is the "Old Machine Rate."

Under this method, the amount of indirect expense

for a certain period is divided by the number of hours the machines have been in operation during that period, and the rate per hour is applied to the product, according to the number of hours it has been in process, as its share of the overhead. In common with all other general methods, it will produce accurate results only when the conditions are substantially uniform. The machines should be alike as to cost, power, floor space, etc.; and this practically limits its scope to departmental distribution. When such conditions exist in a department, the old machine rate is both convenient and accurate, and will naturally be selected in preference to more complicated methods.

In departments where bench work is combined with machine work the method breaks down, because it makes no provision for anything outside of machine-made products. For the same reason it is almost never suitable for distributing general operating expenses.

(6) New Machine Rate

The "New Machine Rate" represents the modern application of the machine rate principle to complex conditions. It connects or welds three principles or ideas into one working system.

(1) It employs the machine rate principle, as stated.

(2) It recognizes and provides for the differences in indirect expenses that arise from different kinds of machines.

(3) It is specifically devised to absorb, as direct charges, all the indirect expenses that can be associated directly or indirectly with the operation of any machine or process.

In installing the new machine rate, the department is taken as the unit whenever possible; but if a department includes different machines or processes, a further subdivision of charges must be made inside the department itself. The essential point is to reduce the unit to processes of the same kind, or to the machines used in such processes, even if this carries it down to the single machine.

The object in view is to collect the various charges against each machine or process in such a way as to know what it actually costs to run the machine per hour; *i. e.*, what the hourly machine rate is when the operations or processes have been classified, and the charges have been made, each item being considered by itself. In making up the charge per hour only the actual number of operating hours for the cost period is considered.

In making up the machine rate, the labor cost is obtained from the time reports, as is also the actual number of operating hours.

Circumstances must determine whether the material cost should enter into the machine rate or not. If the materials operated on vary in grade or price, the rate is made up of the other expenses, and the material cost not included until after the process cost for each article or order is calculated.

The depreciation per hour is found by dividing the cost of the machine by the total estimated number of working hours in the life of the machine.

Most of the floor space charges, and those resting on the value of the machine, as interest, insurance, etc., are steady, or annual, charges, and accumulate whether the machine is idle or not. These charges for the cost period are made a part of the machine rate by being divided by the number of actual working hours. If there

is very much idle time on the part of a single machine, it may be best to make the annual charges for such machine a part of the department indirect, and so spread the cost over the department, instead of centering it on the small amount of product actually going through the machine.

Power charges must be determined by taking an indication of power. Allowance for horse-power lost in transmission may be made if there are marked inequalities, or if great exactness is desired. If no such allowance is called for, the first step in determining power charges is to calculate the total horse-power hours of all machines as actually operated. Multiplying the horse-power of a machine by the number of hours the machine is operated gives the horse-power hours for that machine; and the total for the plant is found by adding the results for each machine. The power generated at the engine but not indicated in the above total is simply considered as unutilized power, the cost of which is borne pro rata by all the machines. The total power charge of the power department of the plant is then divided by the total horse-power hours, which gives the cost of power per horse-power hour. Multiplying this by the horse-power hours of each machine gives the machine power cost per hour for actual operating time.

After all the charges possible have been made directly, the residue of indirect expenses must be considered. There are two classes of these—expenses that can be identified with certain departments, and general operating expenses for the plant as a whole.

First, the general operating expenses are distributed over the departments. Second, each department adds to this share of the general expense its own departmental indirect expense, and proceeds to distribute the total over its own product, the method depending on the basis of the cost system.

If the departmental costs are based on a unit of measure, as the ton or gallon, the total indirect expense of the department is divided by the total output, giving the rate per unit, and the rate so obtained is distributed among the machines or processes by multiplying the number of units of product operated on by the rate per unit.

If the costs are based on time, the departmental expense is divided by the total number of machine-operating hours; and this rate is added to the direct rate already established, which gives the complete or final rate per hour with which to charge the product of that department.

In special cases, the department indirect may be distributed over the machines or processes on the basis of labor cost or labor hours, the justification lying in the circumstances.

It may be well now to review the method as outlined.

(1) All expenses which can possibly be charged direct to machines or processes are so charged.

(2) The general operating expenses are distributed over the departments as units, and become a part of the several departmental indirect expenses.

(3) The total departmental indirect expenses are distributed over the machines or processes of the department.

(4) Combining the charges of 1 and 3, the total machine rate is determined.

Suppose an article now to pass through several departments or processes. Multiply the number of hours it is operated on in each process by the machine rate for

that process, and the cost of the various processes so calculated will, when added together, give the total process cost.

If the material cost constitutes a part of the machine rate, this result is also the final factory cost; if not, the material cost must be added to the process cost to get the final result.

The scope of the new machine rate method should be clear from the foregoing description. It can be used when all operations are performed by machines, but it cannot be applied to general bench work and miscellaneous forms of hand labor.

(7) Fixed Machine Rate

The "Fixed Machine Rate" is characterized by three special features:

(1) The rate itself is an estimate, and is made in advance.

(2) The rate is estimated on the basis that every machine in the shop will run full time.

(3) All charges unabsorbed by the estimated fixed rate are distributed through a supplementary rate, the special feature in this being its relation to idle time.

In practice, the fixed machine rate is employed in various forms, and with sometimes quite essential differences. For instance, it is sometimes used departmentally, and sometimes it covers the whole machine production of a plant, each machine having its own rate, and there being no class of expenses recognized as departmental. Again, the rate may be considered as a single rate covering all forms of expense, or it may be constructed as a total

rate composed of component rates, each rate representing the estimate for a certain class of expenses. The particular method chosen, in conjunction with the conditions of manufacture, will affect the accuracy of the results to a considerable degree.

We will first consider it as a single rate. The estimate is made either by a careful analysis of all the elements of expense, or by referring to the results of past experience. In the latter case the average results of a period of years are generally taken. In either case it is supposed to include all production expenses incident to the operation of each machine.

The total expense assigned to each machine is then divided by the maximum number of operating hours for any chosen period to find the machine rate per hour; *i. e.*, the estimated cost of running the machine one hour. This rate is then charged against the machine, irrespective of the actual cost per hour, or the actual time of operation.

The sum of all the rates or machine charges in any department is charged against that department in the departmental expense account, or, if no departments are considered, the total of all estimates is charged against a general factory expense account. Whatever difference appears between the estimated charges and the actual expenses for the period is adjusted over the factory through a supplementary rate, which may be applied departmentally or over each machine separately.

If all the machines run full time, it is obvious that all the charges as estimated will be absorbed into the product; but this is very rarely the case. Besides the idleness due to dull times, there are often machines that, because of great capacity or peculiar product, are used only a fraction of the whole time. The question arises as to what to do with the charges written against a machine for

the time that it is idle, which seem to apply to nothing. If they are added to the cost of the product, they increase it out of all proportion. For example, if a machine were busy only one day in a week, the product made that day would, under such a rule, have to bear the expenses of the whole week, including charges that do not apply to it in any possible way. The result would be inaccurate on the face of it.

To avoid such an evident fallacy, the costs, as determined by applying the rate to actual running time, are subtracted from the estimated cost to find the amount still unabsorbed. This is considered as an indirect expense estimated but not actually incurred, so it is subtracted from the departmental, or from the general factory expense account, as the case may be, in order to make the proper adjustment.

This principle in itself is wrong. The plan of deducting the rate of idle machines from the general expenses implies that there are no direct expenses connected with the machines when they are not working. But this is not true; for interest, insurance, floor space charges, and certain other items go on just the same.

Evidently, the fixed rate will be unsatisfactory unless provision is made for the fixed or annual charges that accrue whether the machines are idle or not; and these charges must be distinguished from the charges arising out of actual operation, which may be designated as operating charges. Of course, allowances may be made afterwards by adjusting the supplementary rate, but this would be a direct contradiction to the principles and purposes of the method itself.

To avoid these difficulties, separate fixed rates may be calculated for the different classes of expense, and the total of these rates regarded as the maximum rate for

operating time. For instance, one rate may stand for the operating charges only, while another may represent the annual charges assignable to any particular machine or department. A third rate could be fixed to include a pro rata share of the estimated general operating expenses. If it is desired to analyze the expenses according to rates, the total rate could be divided into as many component rates as desired.

Allowances for idle time would now be made as follows: The maximum number of operating hours is multiplied by the total rate for each machine, which gives the total amount charged against that machine. The sum of all these charges constitutes the total estimated factory charge. The number of idle hours for each machine is then multiplied by the "operating expense rate" only, which represents the expense charged against the machine but not actually incurred. When the sum of all allowances for idle time is subtracted from the total estimated factory charge, the result is the net estimate of all charges. The difference between the net estimate and the actual expense is then adjusted through the supplementary rate.

In such case the supplementary rate becomes far more important, because it is no longer limited only to adjusting mistakes in the estimates, but also becomes the indicator of idleness in the factory, and provides the means for distributing the resulting burden over the whole product manufactured. The supplementary rate, which distributes these expenses, reflects in actual figures the fact that idleness in one part of a plant is a burden on the rest of it.

The "Fixed Rate" as a method is adapted only to shops where the greater part of the work is done by machines. The drawbacks are that it is primarily an esti-

mate at best, and that it is too rigid to reflect all the fluctuating phases of actual production.

Miscellaneous Methods

Various modifications and combinations of methods for the distribution of expense have been devised to meet special conditions in different lines of business. For the most part they are "percentage" plans in some form or other. It has been shown that accurate costs cannot be obtained from an arbitrary percentage added to the prime cost of the product, except in the most elementary conditions, where there is only one class of product, and all processes are the same. This, however, does not forbid the application of a percentage to the output of a department for the distributing of purely departmental expenses. In fact, the direct labor cost is a percentage plan, only it is not an arbitrary percentage plan, since it uses for a base one of the factors of production.

The departmental condition where an arbitrary percentage may be safely used for distribution of expense must be judged by direct observation. In any case the percentage method will fall short of the desired standard in the matter of analyzing expense into the different items of which it is composed.

In shops where the material constitutes much the larger part of the prime cost, and where the processes are uniform, experience has shown that the indirect expenses may be distributed either on the tonnage basis, or per hundred, on the number of articles.

In similar conditions, where the material does not differ in grade or price to any considerable degree, or where the business is really little more than assembling finished parts bought in the market, the cost of the material may be substituted for the quantity as the unit

of distribution. However, such special conditions rarely exist in a business of much size.

There are also cases where the principle of the machine rate is applied to the operator of the machine instead of to the machine itself. It may be used where the wages of the operators are different, and where operators go from one machine to another.

The same principle is sometimes extended to cover a whole department; that is, a rate is made for the total productive labor hours of all the men in the department. It has been called the "Sold Hour" plan and was originally devised to apply to the printers' trade. It is adapted to industries where any man in a department may be called on to do any job coming to that department.

CHAPTER VI

WAGE SYSTEMS

Since the prime object of cost systems and cost methods is to increase efficiency, and since a knowledge of wage systems is necessary for the designing of a proper cost system, it is very necessary that the accountant be familiar with the workings and advantages of the various methods of paying wages.

The purpose here is to present and explain briefly the different wage systems that are commonly recognized, and to indicate certain advantages or difficulties connected with their adaptation to conditions. No one method can ever be recommended as the best; for each has its own characteristics, which make it peculiarly suited to some conditions, and at the same time impossible in others.

The general methods or plans of paying wages are known as:

(1) Day Rate
(2) Piece-work
(3) Differential (piece) Rate
(4) Premium
(5) Bonus
(6) "Stint" System
(7) Contract System
(8) Profit Sharing
(9) Stock Distributing

Each plan is subject to more or less modification. There are, particularly, many forms of the premium and bonus systems, some of which are known as the "Differential Bonus," the "Gantt System," the "Santa Fé System," etc.

(1) Day Rate

The "Day Rate" method groups several workmen in a body, and pays each one a certain sum for a certain number of hours' work, this amount depending partly on the skill called for, partly on the locality in which the plant is placed, and partly on the labor conditions existing at the time. This is the original elementary method; and since all the other plans have been devised in an effort to get away from it, it is natural to assume that there are grave defects connected with its use.

Many of these can be traced back to a single general cause, "lack of incentive." The workman has little or nothing to gain by putting his heart in his work and exerting himself. He is kept up to about a certain dead level by the fear of losing his job, and that is all. Why should he do more than the man next to him, when they are both paid alike? This reasoning does not apply to the one man in a thousand who goes ahead and by sheer energy makes a place for himself "higher up"; but it does apply to the great mass of workers. The result is shown in both quantity and quality of output.

Still another objection to this plan comes from the difficulty of finding labor costs, for a uniform labor cost per week is nowhere near a uniform cost per article made. The wages remain even, while the product varies from day to day, and still more between man and man.

There are classes of labor, however, for which no other kind of rate is applicable. Where the work is a pure

function of time, as in the case of firemen, watchmen, inspectors, etc., the natural rate is a time rate. Repair men, inventors, and men who are planning and constructing special machines, also come under a time rate, because of the nature of their work. In general, indirect labor is more suited for payment by time than direct labor.

(2) Piece-work

The "Piece-work" plan is a system of paying wages on the basis of the amount of work done, the rate being based on past experience or ascertained by test. Under this plan the employer, after making what he considers a fair estimate, sets the workmen's rate for the various operations incident to the production of an article.

If the rate is fair, the entire arrangement looks so equitable that it may be surprising to learn that in many cases much friction and dissatisfaction have arisen from its use. A question at once arises concerning the cause.

To answer this we may sketch an imaginary case. An employer, having decided to introduce the piece-work system in his business, sets out to determine the allowance he should make on each piece of work. He and his assistants watch the men and their work for some time beforehand. Then he makes what he considers a fair allowance for the increased production that will follow under the new plan, and waits for results. Under the stimulus of payment proportioned to effort, the rate of production soon shows enormous gains; and the employer finds that production has increased 50 per cent, 60 per cent, or has even doubled, instead of increasing according to the low per cent he allowed in discounting the new rates. As a result, the men who were earning, say $2.75 per day, are soon earning $4 or more.

By this time the employer is likely to think that his

employees cheated him in the beginning, and, as a result of this, are now receiving altogether too much pay; so he proceeds to cut the rate per piece, and the trouble with his workmen begins. They, on their part, soon discover that they are between two fires; if they produce too little their wages are small, and if they produce too much they receive a cut, after which they must continue to work harder and receive no more pay than they did formerly. The natural result of this is an agreement between the workmen in each class to limit their production to a certain amount which they consider safe. At this point the piece-work system has broken down and failed in the purpose for which it was introduced.

In studying the above instance, two conflicting lines of action are seen. The employer is working for the largest possible results for a given wage scale, and the men are working to receive the maximum wages for their time and work. The employer must have had in mind that the wages would not increase much over what they were before, or at least not in the same proportion as the production increased. So he fails to see where he has gained anything by his change of methods. The workmen consider that they have been trapped by the cut in the piece rate, and are correspondingly bitter over the situation.

It is clear to be seen that the critical point here lies in the rate per article. In the example given, the employer was ignorant as to just what the men could do; and this is the basis of trouble in nine cases out of ten. To establish a successful piece-work system it is essential to set such a rate that, barring unusual business depression or some equally untoward event, it can be maintained fixed and unchanging.

If the employer wishes to approximate maximum pro-

duction, he must be prepared and willing to pay more than the ordinary day rate he paid before; and no piece-work plan will attain its object unless he takes that stand. If he can afford to pay a certain amount for the making of an article now, he can surely afford to pay the same amount per article when a larger number are produced per day; and all the more so because the indirect expenses are increased comparatively little for an increased production in the same time, while, as these expenses are distributed over a larger number of articles produced, the cost of each article is proportionately decreased.

The first step necessary to determine the proper rate is to get true records of the work that can be done. In the matter of small, or wholly machine-made articles, this is not difficult. If the operations are complex and include much handling of the material, it will be necessary to separate the whole process into simple operations, and fix a time for each one. The sum of these time rates, plus a percentage for unavoidable delays, will determine the time to be taken on the article as a whole. These analyses are important items in establishing a cost system; and experience has shown them to be the most accurate and practical methods of fixing the proper rate.

(3) Differential (Piece) Rate Plan

The "Differential Rate" plan is a specialized piece-work method modified by an application of time rate to the work. The idea is to pay a certain piece rate up to a certain amount of production in a given time, and above that amount to pay an increased rate either on the whole amount produced, or only on the output above the set standard.

The considerations and cautions mentioned in the straight piece-work plan are all applicable here, and with

double force, since the ideas are the same but more emphasized.

The differential rate plan is devised specially to meet conditions where the indirect expenses are relatively very large. To get the best results in such a case the productive capacity must be made as effective as possible even at a sacrifice in the labor cost. What is lost there will be more than made up by distributing the large amount of indirect expenses over the increased output. The principal disadvantage connected with the differential plan lies in the danger of making ill-judged rates at its introduction. The utmost skill and judgment are necessary to guard against this. The differential rate plan also calls for a well-organized supervising corps, the actual increase of cost for this depending entirely on local conditions, the nature of the shop, and the organization.

(4) Premium Plan

The "Premium" plan, together with its modifications, differs from piece-work methods in basing the wages primarily on a time rate instead of on the product, and then paying extra wages for time saved in the operations. It resembles piece-work in that it presupposes fixing a time rate on the process of manufacturing single articles, or on the separate steps in such processes. The fact that it guarantees a minimum wage, at least, places it in a more favorable light before employees, and often results in less opposition on their part to its introduction than they show toward the piece-work plan.

(5) Bonus Plan

Linked to the premium plan and related to it in general principles, are the several forms of "Bonus" plans. There is an increase of pay as the time to do a definite

amount of work is shortened; but instead of being calculated directly from the time saved, it takes the form of an increase in the hourly wages for the time actually spent, the rate depending on the per cent of time gained, and increasing in proportion.

(5a) Gillette and Dana Bonus Plan

A form of the bonus system described by Gillette and Dana proposes to pay each workman a daily wage plus a piece rate on each unit in excess of a specified minimum. Thus, a laborer receives $1.50 a day for shoveling earth, and on each cubic yard in excess of 15 cubic yards per day, he receives a bonus of 7 cents per yard. If he shovels 25 cubic yards, he receives $1.50 plus $0.70=$2.20.

(5b) Differential Bonus Plan

The "Differential Bonus" is much the same, except that there is an increasing scale for big performances. In the foregoing example the workman might receive 7 cents bonus for every cubic yard above 15, and an additional 7 cents bonus for every cubic yard over 20. His day's pay for the above work would then be $1.50 plus $0.35 plus $0.70=$2.55.

(5c) Gantt System

The Gantt system of differential payment is known as "Task Work with a Bonus." A high standard is set, but one entirely possible of attainment. The workman receives a regular day rate; and in addition, if he reaches the standard, he is paid a lump bonus, which may be 25 per cent or 33 1-3 per cent more than his regular wages. This system seems to have worked out very well in practice; and it is specially recommended as a good transition step from the old day rate to some form of piece-work.

A very important feature of the Gantt plan is the bonus that the foreman gets for every man under him who makes his bonus. Thus, if a foreman had twelve men under him and eight of the twelve made their bonus, the foreman would get, say 80 cents bonus, or 10 cents for each man. The result in practice has been to make the foreman a teacher of the men, invariably giving his attention to the men below grade in order to get them up to the bonus standard.

(5d) Sundry Bonus Systems

The names "Merit," "Standard Operation Plan," "Gain-Sharing," and others, are sometimes given to wage-payment plans worked out in particular shops or industries. If they differ at all from plans here described, it is only in details devised to meet particular conditions.

Since the plans described as "Premium" or "Bonus" are so closely related in object and principle, they may be grouped together for discussion and comparison with other methods.

In introducing a premium or bonus system, the same caution must be observed as with the piece-work systems. It is essential to be quite sure of the correct standard before the step is taken, if the disastrous results that have accompanied too high piece rates are to be avoided. If an error is made on the side of too high a scale, it is less costly than in piece-work, because the employer is not working on so narrow a margin; also, the effect of such an error would be more evenly divided.

(6) "Stint" System

In the "Stint" system the appeal is made to the workman by a gift of all the time he may save. A certain output is assigned as a day's or a week's work. If he

does it in less time, say seven hours, he has earned his wages and is free to go home.

(7) Contract System and List Percentage System

Each employee is regarded as a contractor who has a given time to finish a definite job. As in the case of the "Stint" system, if he gets through beforehand he has earned his wages, but, instead of leaving, he undertakes a new contract. In some cases he is penalized if his work is not done in contract time.

When the units of work are large, the foreman often becomes the contractor, and becomes responsible for the completion of the job. There is a wide amount of freedom in the arrangements for wage paying and profit making between him and the management. Under the contract system in its pure form, he hires his own men and arranges the work as seems best to him, while the company allows him a certain amount for the job. Anything that he saves out of this goes to him as profit. Strict inspection of his work is necessary, of course, to hold him up to the proper standard.

(8-9) Profit Sharing and Stock Distributing

The "Profit Sharing" plan provides that the workmen shall share in a certain percentage of the profits of the shop as a whole.

Stock distributing makes the employee a part owner in the business, and so gives him an interest and incentive to use his best efforts for its welfare.

A special form of profit sharing which has proved successful in operation, though it can be used only under special conditions, consists in setting a price on every article manufactured. The factory is charged only with such expenditures as relate directly to the production of

this article and over which the factory management has supervision. Credit is then given to the factory at these scheduled prices for all articles produced, whether they are sold or not. At the end of the year, or when an actual inventory is taken, the factory account in the ledger will show the factory profit, and will represent the saving or difference between the actual cost and scheduled prices. The saving, according to this plan, is distributed among the foremen of the various departments, and sometimes among the employees as well, according to the rate of pay of each. A penalty is provided for poor attendance; and other penalties of various kinds may be incorporated in the plan, according to the conditions under which it is operated.

CHAPTER VII

RECORDING THE MATERIAL AND LABOR COSTS

Requirements of Cost Finding

The final cost of any order, article or process may be divided into four principal parts, viz:

(1) Material cost
(2) Labor cost
(3) Department indirect expense
(4) General indirect expense

Three important considerations are involved in arriving at final costs.

(1) The cost data must be recorded.

Reports and forms are devised upon which are recorded the various transactions involving raw or part-finished material, the time spent by employees upon various jobs and operations, the wages paid, and the amounts that go to make up the various items of indirect expense. These forms are the original records.

(2) The cost data must be compiled and distributed.

The data, as recorded, must be arranged and classified so as to facilitate the distribution of costs to the particu-.

lar class of product, to the department, or to the operation, as the case may be.

(3) The cost books must be interlocked with the financial books.

The cost books contain the data showing the analysis of the elements of cost, all of which should be controlled by the financial books, so as to permit of a verification of the mathematical accuracy of the transactions in the cost records.

Recording the Material Cost

The transactions that deal with material may be classified as buying it, receiving it, storing it, putting it into operation, tracing it, and re-storing it as part-finished or finished stock. Part-finished stock includes all parts of the product made in different parts of the plant and transferred either to stock or to an assembling department. Any product on which the operating processes have begun but are not yet finished, is termed work in process, except where part-finished stock is transferred from Work in Process account to Part-Finished Stock account.

The forms upon which information about material is ordinarily recorded, are:

(1) Purchase Requisition
(2) Purchase Order
(3) Material Received Sheet
(4) Stock Record—Raw Material
(5) Production or Factory Order
(6) Material Requisition or Bill of Material
(7) Inventory Test

When the information on any of these records is to be used by different departments, carbon copies should be provided, the duplicates being distinguished by different headings, colors, or textures in the card or paper.

(1) Purchase Requisition (Form 1)

A "Purchase Requisition" is a request for the purchase of raw material or supplies, made out preferably by the stores clerk, but sometimes by the superintendent, or the man in charge of the department requiring the material or supplies. Every factory should determine standard maximum and minimum amounts of raw stock and supplies to be carried, below which it is not safe to go on account of the risk of delay in filling orders, and above which it is inadvisable to go on account of the capital that would be tied up. This being settled, the maximum and minimum amounts to be carried should be posted where the material is stored, and should also appear on the stock record. When the amount on hand approaches or passes the minimum, a purchase requisition is made out, and after being approved by some person in authority, is sent to the purchasing department. A rush order should be so indicated on the requisition.

A form of this description does not usually enter into the practical part of a cost system. It may be properly termed an organization form, pure and simple. It must clearly indicate the material desired, but beyond this almost any design will answer the purpose intended, as the information on the form is not often needed after the goods ordered have been received.

(2) Purchase Order (Form 2)

The filing of catalogues and quotations is a matter of office organization, and only the purchase order concerns

the cost clerk. The form is made out in duplicate, or in as many more copies as desired. The original copy goes to the selling firm, and the duplicate is kept by the purchasing concern on the file of unfilled orders. The purchase order is given a serial number, which should be entered by the selling firm on its invoice, as a means of simplifying reference to the order if any question arises.

Should it be desired to use a copy of the purchase order as a material received record, short width carbon paper is used, and a triplicate copy made containing the items only, without specifying the quantity or price. The copy goes to the receiving clerk, who then enters in the "Quantity" column of the order the actual amount of material received. The receiving clerk is thus compelled to count or measure the incoming material, and cannot shirk this duty by using the figures on the purchase order. When the goods have been received, counted and inspected, the triplicate is returned to the office for the purpose of checking it with the material as billed upon the invoice from the creditor; and claims for shortage or damaged goods can then be made at once.

(3) Material Received Sheet (Forms 3 and 4)

Where it is not advisable to use a copy of the purchase order as a material received record, a distinct and separate form is used.

The choice of forms for this purpose will depend largely upon whether charges consisting of freight, drayage, etc., on raw material received are to be added to the material cost. If this is not the case, a very simple form will answer the purpose; but if such charges are included, the design will depend largely on the class of product received and the distribution of the charges.

Provision should be made on the material received

record for showing the purchase order number, the items, name of article, quantity, and the apportioned amount of freight and delivery charges for each item, if these charges are to be added to the material cost. If the material is to be used at once, especially for certain orders or departments, columns may be provided for recording the distribution of the cost and the charges.

If the goods are not to be opened until they are used in certain departments, the invoice must be accepted temporarily as the record, and any "over, short or damage" claim made later. It will be seen that the purchase requisition, purchase order, material received sheet and invoice act as a complete check of the transactions from four different sources. One reason for using a material received sheet to report goods received, instead of following the usual method of checking up from the invoice, is to insure an actual count and inspection of the goods, with the resulting accuracy secured, instead of depending entirely upon the honesty or carefulness of the clerk receiving the goods or checking them off.

(4) Stock Record—Raw Material (Forms 10, 11, 12)

The "Stock Record" is one of the most important of the factory records. It bears the same relation to stock that the cash book does to money, and should be kept with just as much care as the cash book. Stock represents money, and is, indeed, only another form of it. In the same way that the cash book shows the receipt and disbursement of money and the balance on hand, the stock record shows the material received, material delivered, and what should be in the storeroom.

The effectiveness of a stock record depends much on the actual storeroom accommodation, and on precautions taken for not allowing any but properly authorized

persons to remove material from its designated place. If access to the storeroom is easy for anyone, material is likely to be taken to fill orders when the material requisition is incomplete; or the men will replace material damaged in process, without making a record of such withdrawals. The latter is an important leak, and must be watched closely, for if it exists, it both falsifies the costs and creates trouble in the stores department.

The storeroom should be centrally placed, unless a separate storeroom is conducted for each department. In the latter case the storeroom and tool-room may be run in connection with each other. The racks, bins, etc., should be arranged with reference to the materials, so that the whole will have an orderly appearance and not look like a junkroom. Disorder in appearance tends to create disorder in handling. The matter of bin tickets and finding lists, etc., depends on whether the stores are complex and contain a great variety of articles more or less similar.

To record the location of material and to save time and space, a system of reference numbers and letters should be devised. Thus B-4-C-17 might mean a 4-inch bolt to be found in division C, section 17, in the storeroom, where B is the reference letter that stands for all bolts. These symbols may be used throughout the system of records and accounts with a great saving of time and trouble.

Special storerooms or yard places should be reserved for heavy and cumbersome materials, close to the place where these materials will be needed.

A systematically conducted stock record performs other valuable functions besides showing leaks. One of the most important of these is to provide the data for the "perpetual" or "going" inventory. The troubles of in-

ventory taking are well known. It usually takes a long time, causes much work, and sometimes necessitates the temporary closing of the plant. Even then the accuracy of the inventory is questionable, especially as to goods in process; yet its information is essential in the preparation of any reliable statement of financial standing and earnings. With a well-kept stock record these usual inventory troubles are avoided, as a complete inventory is at hand at any time, showing both the amount and the value of materials in the storeroom, in process, and in finished parts. In order to do all this, the record must be designed with columns for material ordered, received, requisitioned out, and balance on hand.

Besides these columns for inventory information, extra columns may be added to distinguish between material reserved for orders already received and the balance available. This distinction, together with the record of the maximum and minimum amounts, and a column showing material ordered but not yet received, gives all the information necessary for keeping the stock supplies up to working requirements in every respect.

When the same article is carried in stock in numerous sizes, colors, styles, etc., it is sometimes advisable for easy reference to use one sheet for the article as a class, and group the different varieties in separate columns. Active stock will require separate sheets for each article; but where purchases are infrequent and the stock is drawn out in large quantities, one sheet may be sufficient for several, blank lines being left between the different articles.

The stock record should be verified from time to time by actual count, so that any discrepancy or leak may be discovered. It is good policy to verify a certain number of articles each day or week, without letting it be known in advance which articles are to be inventoried. This

plan is described in connection with the inventory test (Form 60).

(5) Production or Factory Order (Forms 13-17)

The importance of the production order depends on the functions it is designed to perform. In practice it ranges from a mere informal notice to begin operations upon a certain class of work up to a complete controlling and cost-finding agent of a special order. Its primary purpose is to substitute written for verbal instructions, so as to avoid mistakes. Besides this, it may be so designed as to describe the order, state the material, patterns and dies needed, plan the work as to time and department, trace the work at any stage, report the actual production and classify it as good or defective, collect the costs as they are incurred, and also show their distribution. It is not recommended, however, that the form be used for all these purposes, except under certain conditions in a special order system.

Production orders are of three kinds, and each kind should have a distinctive size, color, or heading, as the costs incurred are of different nature and must be charged to different accounts. The three classes of orders are:

(1) Manufacturing production order, which applies to the regular output of the factory.

(2) Shop production order, which provides for construction, renewals, or changes in the factory.

(3) Repair production order, for making necessary repairs to the equipment.

As many copies of the production order may be prepared as the conditions demand. One copy may go to the stock clerk, so that he will know what the requisitions

should call for, and prevent employees from taking out materials for an order not issued. When a copy is used in this way, the stock clerk should check the material that relates to the order, and should not deliver any extra material except upon the authority of the superintendent or manager, any such supplementary requisition giving the reason why additional material is required. Used in this way, the production order guards against dishonesty, and brings to light mistakes and defective work.

A second copy may be sent to the shipping clerk with directions as to the disposition of the finished product, so as to facilitate deliveries. A copy may also be kept at hand in the manager's office to inform him of the orders that are being worked on in the shop.

When an order is issued covering a product that passes through several departments, some of which require different specifications, or when the work on the order is to go on simultaneously in several departments, sub-production orders may be issued for the work of each department. If the work is well systematized in the factory, sub-production orders may be issued at once, to all departments, stating the exact day the order is supposed to reach them. If the work falls behind the schedule, it is known at once; and the foreman of the department in which the delay occurs is asked to explain. This method of keeping work up to schedule time is especially valuable in case of orders where shipment is guaranteed by a certain date.

The production order may also be in coupon form, each department filling out its coupon and turning it in at the time the job is transferred to the next department. The work can thus be located at any time by the coupons on file. When used in this way, the production order takes the place of the piece tag which is often used to fol-

low a job through the plant, and which shows that the necessary material for a particular job has not been appropriated for other uses.

If the production order is used to record the cost in addition to regulating the production, the form should be designed to show the material used, employees' time and wages, and indirect expenses. Provision may also be made for the classifying of such special indirect expenses as can be charged directly to the order. The design should be such that the cost clerk may arrange the data and ascertain the total cost of the order directly on the form. The order then serves the purposes both of collection and of compilation.

When an order covers large contract work it is often desirable to divide it among departments and into sections—"sections" here meaning not parts of the department, but parts of the work to be done. The time of the employees should then be reported, showing the time consumed in each department on each section of the work. By using section numbers it is possible to compare costs with estimates, and to follow the progress of the work more intelligently.

(6) Material Requisition or Bill of Material (Forms 18-23)

(1) A "Material Requisition" is generally used where the material consumed on orders is subject to constant changes. It is made out by the department requiring the stock, and presented to the stock clerk, who may compare the requisition with the corresponding production order before honoring it. The requisition should be dated and numbered, should show in detail the description and quantity of the material wanted, should be signed by the party receiving the material, and approved by some one in authority. Provision for costing the material requisi-

tioned out will depend upon the stock system in use—that is, upon whether the system provides for showing quantity only, or both quantity and amount.

(2) A "Bill of Material" may be compared with a regular formula, and is used when consumption of material is definite. It takes the place of material requisitions in factories where the same articles are manufactured repeatedly, using the same amount of material. A bill of material is made out for each article manufactured, and a copy given to the stock clerk. When the production order is used as a material requisition all that is necessary is to present a copy of the same to the stock clerk, and he will give out the material according to the amount to be manufactured.

No material should ever be issued not covered by the bill of material, unless on a supplementary material requisition, showing either that there is something wrong in the original bill, or that there has been defective material or work. Nor should any material ever be given out without a receipt from the party taking it.

Where many different kinds of material are used in one article, and the product of the plant is fairly standard, the bill of material may be printed in quantities according to articles, and the printed copies used as separate requisitions. When the material for an order is required, the bill of material given to the stock clerk should specify the order number, as well as the number of articles. When the material is drawn out the stock clerk should check it and have it receipted for as it is delivered.

In the event of material being returned to stock, a storeroom credit slip should be issued and be attached to the original requisition, or, if preferred, a regular form of material requisition or bill of material may be used and stamped "Returned."

Where operations are suspended, to be taken up again

later, or where the product is not assembled until after sale, much of the material finds its way back to storerooms, and must be drawn out by supplementary requisitions. The part-finished stock or finished parts' requisition is made out by the assembling department, or by the sales department if the parts are sold separately.

Where a process system is used, and the cost is charged to the process, and not to an order number, the bill of material may be made out according to operating departments; and the list of material classification need cover only the items used in that particular department or process.

(7) Inventory Test (Form 60)

This form is intended only for testing the correctness of the book inventory, *i. e.*, the stock record, and may be used in connection with raw material, part-finished and finished stock, and sometimes with goods in process of manufacture, depending upon the system in use. Where inventories are not taken at frequent intervals, some means of testing the correctness of the book inventory should be provided. The reliability of cost figures depends to a great extent upon the correctness of the records showing the quantity of stock received and delivered to the operating departments of the factory.

Whenever it is desired to test the correctness of the book inventory as to any particular class of material, the stock clerk should enter the article and location only on the inventory form, after which the amount of the material on hand should be counted and entered under the caption "Actual Count." The amount on hand, as shown by the book inventory, should then be entered under the caption "Book Inventory," and if these figures are the same as the actual count, the form should be dated and

filed for reference. If, on the contrary, there is a difference between the book inventory and actual count, the difference should be stated, and, if possible, the cause ascertained.

A difference between the actual count and the book inventory will represent either errors in the stock records or material taken out of stock without a requisition. If the difference cannot be located, so that the proper corrections may be made on the records, the amount of the difference should be charged or credited as the case may be to the proper stores account, and posted to the account styled "Over, Short and Damage."

Recording the Labor Cost

Labor often constitutes the most important and influential element in manufacturing and production cost. Small variations in the methods of handling the men and their reports may lead to great differences in results. That this importance is realized is shown by the large number of firms manufacturing devices for regulating labor and gathering and compiling the labor costs. Time clocks, time stamps, patent time cards, etc., of many makes are on the market for factory use. The complex and variable conditions that exist in manufacturing naturally necessitate a wide variety of methods and forms for gathering the costs.

All forms for this purpose may be termed "Time Reports." Without regard to any particular design, the successful operation of such reports depends largely on the manner in which they are introduced. Clerical labor on the part of factory employees should be reduced to a minimum, so as not to antagonize the men or the management; and what detail work is necessary should be made as much a matter of easy routine as possible.

Requisites of Time Reports

Some of the questions that should be considered in choosing or designing time reports are as follows:

(1) Is the form to be filled in by an employee, or a time clerk, or will a mechanical device such as a time stamp be used?

The first two methods are subject to the criticisms that they are inaccurate, give opportunity for "doctoring" reports, interrupt the work too much, or require too much clerical labor. The time stamp or time clock remedies much of this; and in the end the installation of such devices will be less costly than the trouble which arises from other methods, especially if the factory is of any size or complexity.

(2) Is the form to show the time daily, weekly or monthly?

(3) Is the form to show time only, or both time and cost?

If cost is to be included this will call for additional columns for the cost and perhaps its distribution.

(4) Is it to show direct production costs only, indirect only, or a combination of both?

(5) Is it to be used by individual employees or by department groups?

Combination reports for all the men doing the same class of work may be entered on a single sheet, which may also be arranged in a pay-roll form and used as a part of the general pay-roll.

(6) What is the wage system in use?

If piece-work, the report need show the quantities and time only, the cost being left to appear on the pay-roll and cost records. When the work is partly day-work and partly piece-work, either additional columns or separate forms may be chosen. If a sliding wage scale is used, as in the differential rate or premium system, the costs should appear on the report, separate columns being added if desired, to show the extra wages earned. The rates may also be printed on the card.

(7) Are the reports based on the time for one article or process, or on the number of articles per unit of time?

If the latter, the report may provide for data covering several days or a week. If the former, the report should have columns showing the labor cost applying to each order number or article, unless the time is summarized on another sheet for this purpose.

(8) Is the labor to be charged to the product direct, or to the machine or process under a machine rate method?

In either case a time unit or a quantity unit may be used as standard.

If the labor is to be charged to the product or the order as a whole, provision may be made on the reports for summarizing the charges of the different parts, though these are generally recapitulated on separate sheets. When a machine rate system is in effect, the name or order number of the article, machine, or process chargeable

should be shown. It is often desirable to have a space on the report for defective work; and in a machine rate system the reports may include the distribution of other charges, thus making the form a statement of the costs of a particular machine.

The whole system of time reports should be devised with certain purposes in view. It should be possible to compile and analyze them to find the labor cost of (1) any order as a whole, or any part of it; (2) each article of a class; (3) any operation or process, either on the basis of each article or order, or per unit of time.

The time and cost devoted to production should be easily separated from the time and cost of non-productive labor. Further, the arrangement of the time report should be designed to facilitate the preparation of the pay-roll. Occasionally a system can be devised whereby, as already suggested, the time reports turned in become the pay-roll without any further recapitulation. A time report where quantities are shown may be used in certain conditions as a production report, which, when summarized by departments, will give the production report of the whole department.

Forms of Time Reports

A number of time report forms are shown in the present volume (Forms 26-34), not with the intention of standardizing any of them, but in order that the different conditions encountered in gathering and recording labor cost may be properly covered, and in order to suggest methods of gathering labor cost data.

Daily Time Report (Form 26)

This is a daily time report, intended to be made out by the workman. It is used where the labor cost is

charged to a classification of product, and not to an order number or process. The report may be used either for day-work or piece-work, in factories where a quantity of the same article is produced.

Daily Time Report (Form 27)

This also is a daily time report, to be made out by the workman. It is intended for collating the cost data according to department, order number and section number. Provision is made for showing the time of beginning and finishing, the amount of production—defective and good—and the amount of the labor cost.

Weekly Time Report (Form 28)

This is a weekly time report, made out by the workman, showing the quantity produced and labor cost according to department, machine number, order number and operation. Provision is made for showing the time daily for a week, and the total time at the end of the week.

Daily Time Report (Form 29)

This form is a daily record made out by the workman, showing the quantity produced and labor cost according to department and order number. It may be used either in day-work or piece-work. The special feature of this form is its provision for showing the material cost of the production as turned out daily.

Daily Time Record (Form 30)

This design is intended to be used as a daily record for one order number in conjunction with a time stamp. While the operations are printed on the card to save writing, only one operation can be registered at a time. This is done by using a check mark for the operation

worked on. The design provides for showing the quantity, total time, rate and cost, and provision is also made for extra wages under a premium system. The design may also be used where the labor charge is made against the machine.

Daily Time Record (Form 31)

This form is also intended to be used as a daily record for one order number or operation in connection with a time clock. The mechanism of the clock, when the card is inserted, punches the beginning and ending time. The record also provides for the reading of the elapsed time without calculation. It shows the order number, account number and amount of production, as well as the time, rate and amount.

Daily Time Record (Form 32)

This design provides a daily record of the time spent on an operation, the starting and ending time being punched in the columns provided on the left-hand side of the card. The elapsed time must be calculated and entered on the face of the card. The operation should be checked off, and the cost should show according to department or order number. Provision is made for showing quantity and premium rate.

Under the caption "Waiting Time" on this record is shown the amount of lost time incurred by the operator in waiting for work, due to either accident or neglect in the operating department.

Daily Time Record (Form 33)

This record is to be made out daily by the workman, and provides for charging his time against a machine, operation or process. It shows the total machine hours,

time started and time finished. Provision is also made for the premium plan of paying wages.

Self-Figuring Time Card (Forms 34a-c)

Forms 34a-c are intended for use in small plants, or where a few workmen only are employed on a certain job, so that the time cost may be summarized on the card.

A daily time card is provided for each workman who renders direct labor in the manufacture of a product. This is in the form of a disk, representing the dial of a clock. The time divisions indicated distinctively are the hour, the quarter hour, and five-minute intervals. Each card is serially numbered, a series being allotted to each class of product or article. This card is issued to the workman on his arrival in the morning, his arriving time being punched on the card by the superintendent, timekeeper, foreman or employer, as the case may be. On leaving the shop for any reason the workman must present his card for punching, so that this card serves the purpose of a time clock.

The most thorough records are obtained when every punch mark made on the card indicates the identity of the person punching it, in the same way that railway conductors indicate their identity by their punch mark on tickets.

The daily time card is intended to be used in combination with the self-figuring cost card. This, comprising also a job card in disk form, is only slightly larger than the time card. The cost card accumulates upon it the following data:

(1) The record or identity of each workman who renders direct labor on that job.

(2) The number of the job and the date.

(3) The time and exact money cost of each workman's labor on the job. As many as eight different wage rates are automatically figured on the card, so that the cost of the time the respective workers spent on that job is readily determined.

(4) The cost of materials directly used on the job.

(5) The indirect or overhead costs properly chargeable to the job.

The cost card has a series of concentric circles, each constituting in effect a column of numbers. These are the money equivalents of the time divisions or intervals shown on the time card. Each circle represents twelve hours of labor cost, shown in five-minute intervals, and each at a different wage rate.

One circle, for example, is for a $20.00 per week workman, another for an $18.00 man, another for a $16.00 man, and so on.

For illustration, a workman upon arrival is given his time card with a perforation showing the time. He is also given his job card, which indicates his job; and he sets to work—the time of beginning being punched on his time card. When he has finished his part of the work on that job, he places his time card on the job card so that his "starting" perforation is over the starting point of time cost in his circle or wage level. He then punches both cards at the spot representing his finished time. By this punch he has indicated the number of cents' worth of his labor to be charged to that job, without any figuring. The next workman at the same wage rate who works on that job, follows the same course as the first, except that when indicating his finishing time he lays his time card over the job card, so that through his "start-

ing" perforation he sees the "stopping" mark of the previous workman. In this way the direct labor cost is cumulatively recorded on each job. If the rate of the second man is different, he places his starting punch on the starting point of the cost card as before, but in the circle which represents his rate of pay. As each job card of this standard design has only the costs of twelve hours of work for each of eight wage rates, more than one job card should be used where more than this time is consumed.

On the back of each card is a ruled space for summing up the total costs. When a cost card has been filled, the total costs it contains are noted on a fresh card in the total cost space; and the process is repeated as often as is necessary.

47-51, study in chap. 15-9-

Forms, 45-46 in chap. XV,

CHAPTER VIII

COMPILING THE COST DATA

With the cost data once at hand, as found in the various material and time reports, the next step is to arrange and summarize this information. The present chapter shows what becomes of the information already recorded, and how it eventually finds its way into the factory or operating ledger.

Records and Forms Generally Used

The records listed below are those used for compiling the cost data. They are discussed in the order in which they would probably be put into operation, rather than in the order in which they are listed. It will be noticed that these records divide themselves into two groups; first, those serving the twofold purpose of recording financial transactions and also of furnishing information for the cost records; and, second, those dealing almost entirely with data relating to costs.

(1) Financial Records

Purchase Journal
Accounts Payable Voucher
Register of Accounts Payable
Pay-Roll
Billing and Shipping Records
Credit Certificate
Register of Sales and Costs

(2) Cost Records

Material Received Summary
Report of Material Delivered
Analysis of Pay-Roll
Statement of Factory Expenditures
Process and Machine Cost Records
Production Report or Production Summary
Defective Work Report
Cost Sheet
Stock Records—Part-Finished Stock
Stock Records—Finished Stock
Cost Journal
Operating or Factory Ledger

Purchase Journal (Forms 5, 6)

A record of this character, sometimes called the "Purchase Analysis," is frequently used in the simpler cost systems.

Form 5 should be used only where an account is kept of the purchases according to classification of material or product. The form is suitable where a proof system for estimating costs is in use.

Form 6 is an analysis of the purchases and expenses, and should be employed where a voucher system is not in use. Where this record is introduced, accounts are opened in the general ledger for the various classifications shown. At the end of the month the "Total Amount" column is credited to the Accounts Payable account, and the total of the various columns up to and including administrative expenses is charged to the debit of the respective accounts.

The column "Sundry Accounts" is intended for classifications not otherwise provided for. These accounts are

either posted individually to the debit of the extra classifications, or they are summarized and so posted at the end of the month.

Accounts Payable Voucher (Forms 7, 8)

The "Accounts Payable Voucher" is a form used for listing and classifying all expenditures incurred, whether for material, labor, indirect expenses, selling expenses and administrative expenses, or for additions to the plant, furniture and fixtures, etc. The form provides for recording the number of voucher, name of creditor, date, amount and classification of the items contained in the invoices attached to the voucher, and also for information as to the payment of each; as date, bank and check number, approval, etc. In order to facilitate the making of proper classifications, and their entry in the accounts payable register, it is well to have the names of the accounts which are most frequently affected printed upon the voucher. This also saves the time involved in writing in the names of the accounts every time a voucher is prepared.

The invoices from the creditors are attached to the accounts payable voucher and also copies of the purchase requisition, purchase order, material received sheets, and sometimes the cancelled check, when this is returned from the bank. Thus it will be seen that the voucher provides for a complete history of the purchase transaction. A separate voucher should be prepared for each creditor from whom purchases are made, but in case several transactions with the same creditor have occurred during the month, and the account is paid monthly, several invoices may be attached to the same voucher.

When the pay-roll is distributed through the accounts payable register, a voucher should be prepared for the pay-roll.

The information under the caption "Operating or Factory Ledger" should be posted to the accounts in the factory ledger under the proper classification.

Register of Accounts Payable (Form 9)

The "Register of Accounts Payable" is the record in which the accounts payable vouchers are entered and summarized. The vouchers are usually entered in numerical order according to date. The register of accounts payable is sometimes known as "Voucher Register," "Accounts Payable Register," "Record of Audited Vouchers," and "Creditors' Record."

The record generally provides columns for recording the following information:

Date, number of voucher, name of creditor, amount payable, and distribution of the amount into the columns provided for the classification, as shown by the accounts payable voucher. The record also provides columns for showing the information relating to the payment of the voucher.

One of the principal reasons for the use of a register of accounts payable is the fact that it dispenses with the necessity of keeping detailed ledger accounts with the creditors, thereby saving considerable time.

At the end of the month the total of the column headed "Vouchers Payable" is posted to the credit of that account in the general ledger. The totals of the columns under the captions "Operating Accounts" and "Property Accounts" are posted to the debit of the respective accounts in the general ledger.

The vouchers payable account is the controlling account of the register of accounts payable.

Under the caption "Miscellaneous Accounts" will be entered the items which are not provided for in the other

classifications, and these will either be posted individually to the debit of the account affected, or be summarized at the end of the month for posting.

Material Received Summary

A summary is sometimes prepared from the material received sheets, and may be used where different shipments of the same class of raw material have been received, the price remaining the same. The posting of material received, when a summary is not used, is taken from the material received record. An entry is made on the accounts payable voucher for material received, according to classification, and it is also entered in the "Factory" column in the register of accounts payable. An entry is also made of the material received on the debit side of the raw stock record. In case the material is intended only for a special order, it should be entered on the cost record of that order, and then need not necessarily appear on the raw stock record.

Report of Material Delivered (Forms 24, 25)

If the postings are made daily from the material requisitions, no summary of material delivered to the operating departments is needed, but where the cost of the material does not fluctuate, it may be of advantage to summarize weekly, or at the end of the cost period.

In many kinds of manufacturing, differences occur in the cost of the raw material without any corresponding difference in the quality of the material, as in the buying of cotton-seed oil, or hops. In such cases, the average cost of material for the cost period is generally taken and treated as if it were the real cost. Unless this is done, or unless the price remains stationary, the summary of material requisitions had better be omitted, as its advantage lies in collecting

many charges of a similar kind into one general charge for posting.

Form 24 is intended to classify the material used according to the selling classifications of the product only, and is especially adapted for a system in which estimated costs must be proved.

Departments A, B and C represent, on this form, operating departments of the plant. The captions 1, 2 and 3, under the departments, represent the selling classifications.

Form 25 is an ordinary record for the recapitulation of material requisitions, according to order number, product chargeable, article, quantity and value. The material delivered to operating departments is credited on the raw stock records and charged under the caption "Material" to the proper "Work in Process" account in the factory ledger.

Partly-finished material taken out of stock is also posted to the cost records according to the classification provided for by the system in use, which may be order, article, job, section or process.

Pay-Roll (Forms 37-40)

The pay-roll is prepared from the time reports for the purpose of summarizing and distributing the amount paid to each employee. The type of form selected depends on the class of system to be used, and the information desired.

Form 37 represents the factory pay-roll for a week, with all the operating departments on one sheet, the labor being classified in the operating departments into "Direct" and "Indirect." Provision is also made for special labor, as in the case of a cupola where a foundry is one of the operating departments. The labor in connection with the cupola is all direct, as the cupola is a

process cost. The labor cost of the power department is also provided for, and as the distribution is made from the total cost, all the labor is regarded as direct in that department. Provision is made for salaries of officers, of office clerks, foremen, supervision, shipping, and any other clerk hire. While the form is very complete, there are many cases where it will not be practicable to use it in its entirety, because of the fact that salaries are combined with the workmen's pay-roll on the one record.

Form 38 provides only for the pay-roll according to department, dividing the labor into direct, supervision and office salary, the direct labor being entered only in the operating departments.

Form 39 provides for recapitulating the labor according to department, direct, indirect and supervision.

The individual time records may be posted daily on Form 40, just as on Form 37; and the total amount of pay is shown at the end of the pay period. The form provides for classifying the labor according to department only, no distinction being made between direct and indirect labor.

The pay-roll may be entered in different ways:

(1) It may be attached to an accounts payable voucher, upon which it will be classified for charging to the various factory accounts as well as to administrative expense accounts. The accounts payable voucher is then entered in the register of accounts payable, where it appears as a credit to the Pay-Roll account, a charge being made to the factory ledger and other expense accounts. The entry is made from the accounts payable voucher to the various department accounts in the factory ledger, and also to the various cost records under the caption "Direct and Indirect Labor."

(2) When the pay-roll is not attached to the accounts

payable voucher, but entered directly in the cash book and charged to a Pay-Roll account in the general ledger, an entry should be made distributing the Pay-Roll account, and charging the various departments, processes, or articles with their proper proportion of direct labor. The indirect labor is charged to an indirect labor account, in total, or under whatever classifications the division of the labor accounts may require.

Analysis of Pay-Roll (Forms 35, 36)

The "Analysis of Pay-Roll" is for the purpose of recapitulating the labor charges into classifications not provided for on the regular pay-roll form, or for those cases where the pay-roll form is not suitable for an analysis.

The information to be entered upon the analysis will depend both on the class of system used and the type of pay-roll. The pay-roll may be analyzed in various ways for cost purposes, viz:

(1) According to departments, operations and processes
(2) According to machine costs
(3) According to classifications of product

Form 35 represents a method of recapitulating the pay-roll for a week according to department, the direct labor cost being charged to a classification of product especially adapted to a departmental system. Provision is made also for the indirect labor. Under certain conditions this form may be used as a pay-roll as well as an analysis.

Form 36 is not intended for pay-roll purposes, but for making a recapitulation of all workmen's time, showing the total number of hours chargeable to an operation

or order. This form may be used to ascertain the total number of hours of the machines or equipment, for the distribution of either machine charges or indirect expenses, on the basis of production hours.

Statement of Factory Expenditures (Forms 41-44)

Indirect expenses are so general in character and arise from such divergent sources that it is good policy to summarize them upon a statement of factory expenditures, which may be used as a summarized statement of factory accounts or as a source from which the distribution of the general operating expenses may be made. A statement of factory expenditures is given, with the figures entered, to illustrate its use more clearly.

Form 41. A form of this character may be used for analyzing either factory expenditures, or selling and administrative expenses. The items composing the expenditures may be entered across the top of the form, with the date and voucher number at the left-hand side; or at the end of the period the accounts may be entered at the left-hand side running down, and the months across the top, thereby making a comparative statement of expenditures.

Form 42. This form is used to analyze factory expenditures only, and is intended for distributing the indirect expenses over the product as a whole and not by department. The record provides for showing information in comparative form, and provision is made to show the inventory at the beginning of the period, as well as all direct and indirect charges, from which the cost of the goods sold is deducted, leaving the inventory at the end of the period comprising raw material, goods in process and finished stock on hand.

Form 43. This is a monthly statement taken from

the factory ledger, and may properly be called an "Analysis of Manufacturing Charges." It represents the operations of one month only. The titles of the accounts are entered in the column at the left of the form, and a column is provided for each operating department.

The monthly statement, when taken from the factory ledger, will show the material and labor charged to each operating department, and an analysis of the departmental expenses. Columns are ruled on the lower part of the form for operations of the storeroom, for general factory expenses, and for the distribution of the same.

The chief purpose of this form, outside its direct information, which is valuable to the management, is to supply data from which may be determined the percentage to be used in distributing the indirect expenses on the cost of all articles as entered on the cost record.

The information shown under the caption "Direct" represents the productive labor of each department, as well as the material used; whereas all the items appearing under the caption "Indirect" represent expenses chargeable directly to each of these departments, except the account "General Operating Expenses," which contains such items as appear in the lower section of the form and do not relate to any particular department. These expenses may be prorated over all the departments on the basis of the amount of direct labor charged to each department, by multiplying this amount by the percentage obtained from dividing the total amount of the operating expenses by the direct labor. The department accounts will then be charged with all the indirect expenses, including the general operating expenses; and the percentage shown will represent the proper amount to be added for indirect expenses to the prime cost of the articles manufactured in any one of these departments.

In the lower left-hand section of this form the storeroom operations are indicated, *i. e.*, the value of the inventory at the beginning of the period, the purchases during the period, and the material delivered to operating departments during the month. This material delivered is recorded in the upper section of the statement under the caption "Direct," opposite the account "Material." The balance shows the inventory of raw material on hand at the end of the month.

The only important difference between Form 43 and Form 44 is that the latter is made in comparative form. The statements of factory expenditures as shown by these forms are of added value to the management when used as a monthly comparative record of the indirect expenses in each department.

Process and Machine Cost Records (Forms 45, 46)

The designs illustrated are used only in a machine or process cost system, provision being made for the distribution of power and machine costs. A detailed explanation of these records will be found in Chapter XV.

Production Report or Production Summary (Forms 47-50)

There are many kinds of production reports to meet the demands of widely different industries. In some cases time reports are used for reporting production, as explained in Chapter VII.

The production report is valuable for indicating the efficiency of various departments. The forms should be so filed that comparison between them will be easy, and discrepancies will be noted at once. In this way the effect of any change of conditions or methods can be accurately gauged. This double service makes the production report one of the most important forms of a system.

Some of the purposes for which production reports may be used are as follows:

(1) Reporting production only
(2) Reporting production and indicating on the report the amount of defective work
(3) Indicating the cost of material
(4) Showing the labor and material cost

The production report is used in many forms. Those shown in the present volume are typical.

Form 47. This form is intended to report the production by department and order number and to show the total produced, the amount defective and the amount good. The operation may also be indicated, if desired.

Form 48. This form represents a plan for gathering the material and labor cost on a production report, but does not provide for indirect charges unless they are included in the machine rate, in which case they would be entered under the column "Process or Machine Costs."

The form is intended to be used principally in a process or machine cost system, and the time of all workmen on one operation may be recapitulated under the caption "Time," according to the hours of the workmen, or the machine hours, depending on the system in use.

Form 49. This form is a monthly report, and provides for recording the production by departments daily, according to the classification of product. It is especially adapted to a departmental system. Provision is made for costing the material on the report. When this is done the rate to be used may be obtained from the bill of material.

The report may be made out by the foreman of a department, or may be compiled from time records show-

ing production, or from production reports which show production only.

Form 50. This form is a monthly report intended to record the production according to department, operation, and order number, if one is used. The columns 1 to 31 represent the days in a month, and are intended for entering the total production each day, according to the operation. Provision is made on the right-hand side of the form for costing the material, the necessary data being taken from a bill of material or material requisition. The information contained on the production reports is entered on the cost records.

Defective Work Report (Form 51)

It is more convenient sometimes to have separate forms for reporting or summarizing defective work than to have columns on the regular production or time reports. The form is valuable as an organization and efficiency report. A certain loss from defective work is almost sure to occur; and the only way to reduce this to a minimum is to have definite reports showing when, where and why the defect occurred.

The mere fact that all defective work is reported to the management will tend to minimize this loss. Also, if there is rivalry between the operating departments as to which can make the best record, and the foremen of all the operating departments receive copies of these reports, it will tend strongly to lower losses on defective work.

The cost of defective work may be charged against the department, job, order, or article, or may go into a special account and be included in the indirect expenses. If it is possible to use some of the material again, as in the case of defective castings, it should be taken back into

stock at its scrap value; and the difference between the scrap value and its original cost may be charged as stated above. The cost of defective work should include its proper proportion of the indirect expenses.

Cost Sheets (Forms 52-55)

All cost data, in whatever form they may have been gathered, must be finally entered on a form showing the complete costs of production. It would be difficult to name any form which could be called a standard form for this purpose, owing to the many different manufacturing industries, the varying conditions existing in plants, and the different types of cost systems.

The forms presented here merely illustrate the methods by which cost data may be entered to show final results. Indeed, special forms are not needed for the purpose, as complete costs may be shown on production orders (especially where the production order represents a customer's order), or they may be compiled on a production report. Both of these plans are illustrated in this book.

In many cases the cost sheet is used as a cost record only; and cost data from all sources are compiled upon it. The best plan to pursue in designing a cost record will depend, therefore, on the manufacturing conditions and the type of system in use or to be used.

Form 52. This is not a record of costs as used in a regular cost system, since it only records estimated costs. It is therefore adapted only to one of the systems where costs are estimated in advance and these estimates are checked by results.

Form 53. This form is intended to show the cost per article where a process system is used. The quantity produced and the time of the workmen are entered according to department, under the captions 1, 2, 3, 4 and 5.

The process rate per hour is ascertained and the process cost calculated. The material cost is then entered, and a summary of this information shows the total cost.

Form 54. A form of this character may be termed a "Progressive Cost Record," inasmuch as the costs are carried from department to department until the final costs are obtained. A separate sheet is used for each department. In the first department no record is made under the caption "Previous Operations," but all the other columns are used, the material and labor costs and the information under "Indirect" coming from the forms containing the required information, according to the system in use. The production of the department is shown under "Quantity," and the total cost under the caption "Total." When work progresses to the next department, the record will show the cost of previous operations as taken from the "Total" column of the previous department's report.

Form 55. This record is intended to be used where all cost data are entered on other forms and then transferred to and combined with this record. In addition, the record is used for showing the number of machines in use in connection with production, and the average production per machine, this information being only of a statistical character.

The postings from the cost sheets to other records will depend entirely on what type of system is in use. Wherever a stock record is kept, an entry should be made to "Part-Finished" or "Finished" stock, according to the proper classification. In a system where accounts are kept representing goods in process of manufacture, whether it be in a factory ledger or the general ledger, the totals, as compiled on the cost sheets, are credited to the proper classification in those ledgers, so that the

balance of the accounts affected will show the value of the goods in process of manufacture.

Record for Part-Finished and Finished Stock (Forms 56-59)

The functions and importance of stock records were discussed under the head of raw material stock records. The present records form a part of the stock system in a factory. The regular forms for finished stock may be used, with the necessary minor changes in the headings, for part-finished stock records.

Form 56 illustrates a simple method of keeping stock records. The form may be used for finished or part-finished stock. The caption "Used" on this design is intended to cover part-finished stock taken back into process of manufacture, either for completion or for assembling purposes.

Form 57 carries out the same idea as Form 56, except that the word "Deliveries" is substituted for the word "Used." The form is also more complete for posting purposes.

Form 58. This might be termed an "Analytical Record of the Finished Product"; and it is used where it is convenient to keep a record on one sheet of a number of different sizes of the same article. Provision is made only for quantity produced, quantity of orders received, and the quantity shipped.

Wherever a form of this character is used, and it is desired to carry the value of the finished stock on the records, it will be necessary to use one of the regular stock records showing the value. In this case, the regular record would provide only for the article, independent of the sizes, the record showing sizes being merely an analyzed statement of sizes in stock.

Form 59. This record, wherever it can be used, makes

about as complete a stock record as could be desired. The particular features of interest are the columns for orders received, orders cancelled, and unfilled orders on hand.

The entries on this finished stock card, costing the production, are taken from the cost record. When goods are sold, the finished stock card is credited from the billing and shipping records, and when part-finished stock is taken out, from either the material requisition or bill of material.

Billing and Shipping Records (Form 62)

It is frequently possible to combine the records for billing, shipping and costing the sales. For instance, an order is received and accepted. The billing clerk then makes out three copies of the bill. The original goes to the customer, the duplicate goes to the shipping clerk—serving as a shipping order—and the triplicate remains in the office for entry on the register of sales and costs. It will be noticed that the triplicate provides extra columns for recording the information applying to the costs, such as rate and amount of cost, the number and date of invoice, the name and address of customer, shipping memoranda, quantity, amount, etc.

Only one form of billing record is illustrated here, and this is presented for the one purpose of illustrating the accounting procedure involved. When a form is to be devised, its design will depend entirely on the conditions of manufacturing and selling, and the system in use.

The information on the triplicate copy, under the caption "Cost Price," is taken either from the stock record or cost record showing the cost of the articles that are to be shipped, and the entry according to selling price

and cost price is made on the register of sales and costs, according to the classification provided for in that record.

Credit Certificate (Form 63)

This is intended for recording the allowances to customers either for returned goods or for a special claim. In case of returned goods, the information will be taken from the material received record, and in case of a special allowance, from correspondence. In the case of returned merchandise, the information under the caption "Selling Price" should be taken from the customer's record, and the information under the caption "Cost Price," from the cost or finished stock record.

The original copy is sent to the customer, showing the amount of credit allowed; and the entries in the books are made from the duplicate copy which is placed on file. The amount of the selling price and cost price is entered on a separate sheet in the register of sales and costs, according to the classification of the sales, in the same manner as the sales were entered. In case a special allowance is made, the entry should be made through the journal, the customer being credited and the proper account being charged.

Register of Sales and Costs (Forms 64, 65)

When the sales are not classified as to departments or article, the sales and costs may be summarized by means of an adding machine; but if the sales are classified to any extent, it is well to use a register of sales and costs for the purpose of recording the information, this being entered daily in total or in detail. It may be necessary to have a separate sheet for each department.

A register of sales and costs may provide for recording the date, the number, the name and address of cus-

tomer, amount and cost of sales, and be provided with columns showing the classification as to the product or department. In addition, the total amount of the sale column, or accounts receivable column, may be divided to show the classification of the customers' accounts.

There are two plans in general use for keeping a register of sales and costs:

(1) Providing for the classification of the sales according to sales and costs for posting to the department and controlling accounts only, this method being used where the posting to the customer is made from the bill.

(2) Providing for the same information so far as the division of the sales and costs into departments is concerned, but providing extra columns for entering each bill according to name, terms, etc., all postings being made from the register.

The choice of a plan will depend on the general billing system in use.

Form 64 illustrates the second plan, whereby the customers' accounts are entered and distributed, according to departments, into sales and cost of sales. Provision is also made on this form for showing the gross profit on each order. The customers' accounts are charged and at the end of the month the total of the accounts receivable column is debited to that account in the general ledger. The totals of the sales columns are credited to the department sales accounts in the general ledger, and the totals of the cost of sales columns are charged to the department sales accounts. Where a controlling account is kept of the finished stock, the total of the cost of sales columns is credited to that account.

Form 65 is a special form for the purpose of analyzing sales according to material, labor and indirect, and is intended to be used only in a system for proving estimated costs.

Cost Journal

A "Cost Journal" is practically the same as the ordinary two-column journal, provision being made for the date, folio for reference purposes, a wide column for explanations, and two money columns, one for the debits and the other for the credits.

Its function is to record and arrange the information obtained from the original factory records for posting to the accounts in the operating or factory ledger.

It is not always necessary to use a cost journal as a posting medium, since the postings may often be made from the original factory records.

Operating or Factory Ledger

The "Factory Ledger" is that record in cost accounting which arranges and classifies the information contained in the original factory records.

The ruling of the factory ledger will depend to some extent upon the type of system in use. In some cases the ordinary ledger ruling is quite sufficient, while in other cases columns should be added for showing a detailed analysis.

The accounts usually found in the "Factory Ledger" are:

(1) Raw Material and Supplies Account
(2) Labor Account
(3) Indirect Expense Account
(4) Work in Process Account
(5) Part-Finished Stock Account

(6) Finished Stock Account
(7) General or Private Ledger Account

(1) Raw Material and Supplies Account

This account shows in total the information contained in detail in the raw material record. It is debited with all receipts of raw material and supplies, and credited with all deliveries to operating departments, and with any material returned to the creditor. Therefore the balance at the end of the cost period should agree with the total of the balances represented by the detailed records of raw material stock, thus creating a control and check upon the work and information contained in the detailed stock records.

(2) Labor Account

The amount of the direct labor, as shown by the pay-roll, is debited to the Labor account; and this account is credited with the amounts of direct labor distributed to the various departments, orders, jobs, or articles, in accordance with the system used. The advantage of having the cost period in agreement with the pay-roll periods is noticeable here, because if the cost period and pay-roll period are in agreement, no balance will appear upon this account.

(3) Indirect Expense Account

The Indirect Expense account is debited with the expenses incurred, and credited with any allowances made by creditors on expense items, and with the amounts distributed to each job, order, article, or department. Separate accounts may be kept in the ledger for each class of indirect expense. When, however, the indirect expenses are kept in one account, they should be analyzed

on the statement of factory expenditures. The balance of the Indirect Expense account is generally a debit, representing prepaid expenses to be carried as deferred charges.

(4) Work in Process Account

For the purpose of controlling the work in process, accounts may be kept in the factory ledger in any one of three ways:

(1) An account styled "Work in Process" may be kept, which will show in total what is shown in detail by the cost sheets. The account is debited with the material, labor and indirect expenses chargeable to the various departments, orders, jobs, or articles upon which operations have been begun, and is credited with the total cost of the part-finished or finished work. The balance of the account then represents the amount of work still in process, and should agree with the cost of the unfinished work as shown by the detailed cost sheets.

(2) Accounts may be kept which will show the work in process in each operating department. When work is transferred to a department the Work in Process account of that department is debited with any cost incurred in previous operating departments, and to this is added the material, labor and overhead cost incurred in the department itself. When the product is transferred to another department the account is credited with the total cost, thus balancing as to that particular work. Any balance remaining shows the cost of the unfinished work in that department, and should agree with the detailed departmental cost sheets of jobs, orders, or articles.

(3) Accounts may be kept with each order, job or article. The material, labor and indirect expense, as distributed, are debited to the order, job or article, and the account is credited with the total cost when the work

is completed and transferred to stock. The balance of each account shows the costs incurred on the unfinished work.

(5) Part-Finished Stock Account

This account is debited with the cost of part-finished stock as far as it has been incurred, and credited with the cost of any part-finished stock requisitioned out, whether for the purpose of completing, assembling, or selling. The balance shows the cost of the part-finished stock on hand, and should agree with the total of the balances as shown in the detailed records of part-finished stock.

(6) Finished Stock Account

The Finished Stock account is kept in the same manner as the other stock accounts, being debited with the cost of the product transferred to finished stock, and also with the cost of any finished stock returned by customers. The account is credited with the cost of the product sold, the balance representing the cost of the finished stock on hand, which should agree with the total of the balances as taken from the detailed finished stock records.

(7) General or Private Ledger Account

This account serves a twofold purpose: first, as the connecting link between the cost records and the financial records; and second, as what may be termed the balancing account of the factory ledger. By means of this account a trial balance of the factory ledger may be prepared at the end of a cost period, which should prove the mathematical accuracy of the postings to the factory ledger, independently of the financial records.

This account is debited or credited as may be neces-

sary when any information entering into the cost records is obtained from the financial records. For instance, when the material, labor or indirect expenses are summarized from the accounts payable vouchers in the factory ledger columns of the register of accounts payable, and the details of this factory ledger column are posted to the debit of the material, labor, and indirect expense accounts in the factory ledger, the General or Private Ledger account is credited. This procedure maintains the equilibrium of the factory ledger and also gives the general or private ledger credit for the expenditures which were incurred for the factory. On the other hand, when shipments of finished or part-finished stock are made, and the stock accounts in the factory ledger are credited, a charge is made to the General or Private Ledger account, for the reason that the merchandise has practically left the factory and the factory records as well, and is now included in the accounts upon the financial books. The balance of this General or Private Ledger account is generally a credit balance and should agree with the debit balance of the Factory Ledger account in the private or general ledger.

Illustrative Journal Entries

In concluding the description of the records for compiling cost data, it may be advisable to trace the more common entries through the journal, showing how the accounts in the factory ledger are affected. It should be borne in mind that these entries pertain only to the cost records, and are given merely to illustrate the entries which are most likely to be used, as it would be practically impossible to give entries covering every point under the specific conditions of various plants. Some of the entries which follow might be combined, thereby saving

time in posting, but they are presented here in their simplest forms for the sake of greater clearness.

Raw Material and Supplies Account..... ....
To General or Private Ledger Account ....

For the total amount of material and supplies purchased and received during the period.

Labor Account..... ....
To General Ledger or Private Ledger Account..... ....

For the total amount of wages during the period.

Indirect Expenses Account..... ....
To General or Private Ledger Account ....

For the total amount of indirect expenses incurred during the period.

Work in Process, Department, Job, Order or Article Accounts..... ....
To Material and Supplies Account.... ....

Total amount of materials and supplies requisitioned out and chargeable to the product.

Work in Process, Department, Job, Order or Article Accounts..... ....
Indirect Expense Accounts..... ....
To Labor Account..... ....

To distribute the pay-roll for the period, charging the direct labor directly to the product or operation, and the indirect labor to the indirect expenses.

Work in Process, Department, Job, Order or Article Accounts..... ....
To Indirect Expense Accounts..... .....

For the total amount of indirect expenses distributed and charged to the product.

Part-Finished or Finished Stock Account.. ....
To Work in Process, Department, Job, Order or Article Accounts..... .....

For the total amount of product transferred to the stock, either part-finished or finished.

Work in Process, Department, Job, Order or Article Accounts..... ....
To Part-Finished Stock..... .....

For the total amount of part-finished stock transferred to operating departments to be completed.

General Ledger or Private Ledger Account ....
To Part-Finished or Finished Stock Accounts..... .....

For the total amount of the cost of the goods sold during the period.

Tuesday

CHAPTER IX

CONTROL OF THE COST RECORDS BY THE FINANCIAL RECORDS

Methods of Controlling Cost Records

The description and analysis of the financial records as a whole is a subject for special books; but since the cost records are practically an analysis of an account or accounts appearing in the financial records, it is necessary to consider the accounts which are affected. In a complete cost system the cost records may be controlled and interlocked with the financial records in one of two ways:

(1) Accounts may be kept in the general ledger, which should control the various items of production cost in its various stages. For instance, accounts should be kept with material, labor and indirect expenses, work in process, and part-finished and finished stock, entries being made to these accounts in the same manner as if they were kept in the factory ledger.

(2) An account styled the "Factory Ledger Account" may be kept in this general ledger. This account represents in total what is shown in detail by the factory or cost records, and the balance is usually a debit, agreeing with the credit balance of the General or Private Ledger account in the factory ledger. The Factory Ledger account is debited with all charges to the factory, as represented by the total of the factory ledger column in the register of accounts payable, the details of which

are analyzed in the factory ledger accounts. The Factory Ledger account is credited with the total cost of sales as shown by the register of sales and costs, when this is debited to the Sales account.

Sales Accounts

The sales accounts may be divided or classified according to departments—departments here meaning divisions of the articles sold. They are debited with the cost of merchandise sold at the time this cost is credited to the Factory Ledger account. They are credited with the total amount of the sales—less returns—as obtained from the register of sales and costs, at the time this amount is charged to the Accounts Receivable controlling account. The balances of the sales accounts represent the gross profit or loss upon each different classification of the sales.

Selling Expenses

A single account may be kept embracing all selling expenses, and this account may be analyzed at the end of the cost period; but it may also be well, where practicable, to keep separate accounts showing the selling expenses for each classification of the sales accounts. Part of the advertising, commissions, salaries, etc., can be related directly to certain classes of product; and these products should always bear such expenses. The expenses that cannot be so charged may be kept in a General Selling Expense account, and apportioned over the classified accounts on some arbitrary basis, such as the cost of sales, or the volume of business done. If there is a balance in the General Selling Expense account, it is generally a debit, and may represent a deferred charge—that is, a certain amount of selling expense in-

curred but not yet distributed, for the reason that it is chargeable to future operations of the business.

Separate accounts are usually kept for each class of selling expense, to show the amounts spent for each item. Each account should be charged with the amount spent, and credited with deductions for any allowances made, and with the amount distributed to the Profit and Loss accounts.

Administrative Expenses

Attention is called to the fact that the distinction between administrative expenses and production costs on the one hand, and selling expenses on the other, may be an artificial one only, as in many cases the administrative expenses are incurred through action or effort that may be in the interest of either production or selling. Therefore it should be borne in mind that any expenses that affect either the manufacturing or selling departments should be charged, wherever practicable, to the proper classification in the department affected. Some of the items usually listed as administrative expenses are as follows:

Salaries of officers
Salaries of office clerks
Rent of offices
Light and heat of offices
Telegraph and telephone
Stationery and printing
Postage
Legal expenses
Car fares and incidentals
Subscriptions
Donations
Miscellaneous

These accounts are charged with the expenses incurred, and credited with any allowances. The balance may be distributed over the various classifications of the sales upon some such basis as used in the distribution of the selling expenses.

Monthly Profit and Loss Statement (Form 68)

The nature and size of the business, as well as the scope and type of the accounting system, will largely determine the nature of the profit and loss statement to be prepared. It may deal only with the totals of the various departments or classes of product, showing the sales, cost of sales, gross profit, selling expenses, administrative expenses, and net profit or loss; or, on the other hand, it may be prepared so as to disclose the details of the cost elements, selling expenses and administrative expenses, together with various percentages which are of value for comparative purposes.

All records, including both the financial and cost accounts, should be arranged so as to facilitate the preparation of statements.

All information called for by the profit and loss statement may be obtained from the private or general ledger. Under the caption "Departments" will be shown the classification of the various selling products. Under the caption "Sales" in the statement of profit and loss will be entered the total debit and credit of the departmental accounts; under the sub-caption "Amount" the sales; and under the sub-caption "Costs" the cost of the sales, this cost being made up of the complete factory cost of the product, including all indirect expenses. Under the caption "Gross Profit" is entered the difference between the amount of the sales and the costs, as shown in the private or general ledger. Under the caption "Expenses"

the totals of the selling and of the administrative expenses should be entered, at the bottom of the page, in their proper columns. These totals may then be prorated over the different departments on the basis of the percentage of the cost of the sales, and the amount to be charged to each department entered in the proper position in its column. Under the sub-caption "Total" is shown the total of the two classifications of expenses; and under the caption "Net Profit" is shown the net profit or loss of each selling department, obtained by deducting the total expenses from the gross profit. In the last column are shown the percentages of net profit in each department.

The preparation of this statement from the private or general ledger, at the end of the month, will be merely a matter of copying off the balances of the departmental accounts, and distributing the balances of the expense accounts.

This statement gives a summary of all the transactions of the business for each month, and represents the final outcome of all factory operations that affect the cost of goods sold during the month.

It should be borne in mind that every figure appearing on this statement is supported by other references; and any figures shown in the "Net Profit" column which are not satisfactory to the management may be investigated, the cause of any loss in percentage shown, the reason ascertained, and the remedy applied.

Balance Sheet (Form 69)

The balance sheet is the statement which shows the financial status of an enterprise, and is prepared monthly from the accounts in the general or private ledger. Under the caption "Current Month" is stated the balance of the

account for the month in question, and under the caption "Increase or Decrease" is shown the increase or decrease from the balance of the preceding month.

One of the most important points in connection with a monthly financial statement is the fact that it brings before the management every month the financial status of the company as a whole, showing the profits and losses, assets and liabilities.

Under the so-called "Inventory Method," profit or loss is only ascertained at long intervals; and in the majority of cases, an unsatisfactory exhibit of earnings cannot be investigated sufficiently to be of any material benefit. Even where such an investigation is possible and results in a betterment of conditions, there is usually a large loss already incurred due to the delay in discovering the defective conditions, whereas, under an accounting system in which earnings are shown monthly in analytical form, any loss or leakage can be immediately investigated, and can, as a rule, be stopped at once, or else be so minimized that no serious loss is incurred. The advantage to the manufacturer is obvious.

Salesmen's Costs (Form 66)

In addition to the records already described, it is often advisable to keep a record of salesmen's costs, which will prove valuable as a basis for comparing the ability of one man with another, or one territory or period with another.

Provision may be made for showing the amount of sales, cost of sales and gross profit, and the salaries, commissions and traveling expenses of each man, together with percentages. All information of this nature may be used to advantage in adjusting salaries, commissions and expenses of the salesmen.

Plant and Tool Records (Form 70)

Valuable information which can be used in determining the rate of depreciation, appraising the equipment, etc., is often obtained from records showing the cost value of machinery, tools or other equipment. Besides making provision for recording the first cost, the form may be designed to provide for installation charges, expenses for repairs and maintenance, depreciation, etc. This information may prove especially valuable in determining whether it is cheaper to maintain the old equipment or to buy new.

In plants where a tool-room is part of the factory organization, it is well to keep tool records in the same way as the material stock record, classifying and arranging the tools so as to show the quantity, and those available for each particular job or machine.

Tuesday.
Dec. 5 †

CHAPTER X

THE EXAMINATION OF A PLANT

Reasons for Examination

The basis of any successful cost system must be sought in the nature of the manufacturing operations, and this presupposes a physical examination of the plant. It is not enough to inspect the books, for an analysis of accounts cannot give all the necessary data. The extent and character of the information needed is limited only by the boundaries of the business; and its classification is a matter of highest importance to the systematizer. He should have a definite knowledge of how to go at things, and of the object of each question he may ask. In other words, the examination should be systematic and thorough.

Procedure

The examination should begin where the raw material is received, and end with the office records. It should follow step by step each process of manufacture, including the auxiliary activities of the plant as they arise in connection with the operations. Circumstances will determine just where, along this line, the power plant should be inspected, but the application and transmission of power should be considered in connection with each department.

The general type of system will be suggested by the nature of the product and processes, and one of the first

considerations must be to see that the lines are properly drawn between processes, so as to provide for a working system of operating departments. As far as possible, each department should be limited to single operations, in order that the costs may be analyzed in the same measure.

The necessary information for the installation of a cost system may be divided into four general classifications, viz.:

(1) Raw material
(2) Power, machinery and processes
(3) Direct labor
(4) Indirect labor, supplies and general indirect expenses

Raw Material and Storeroom

Under raw material, it should be noted how the raw material is received, checked, stored and put into operation. It should then be followed through the factory, step by step, until it is ready for sale as finished stock. The maximum and minimum quantities necessary should be known, and the disposition or utilization of waste and scrap material should be looked into carefully. Special attention should be given to the methods of storing material and part-finished stock, and to the possibility of improvements along that line. If a stock system is not used, there is no one place where leaks are more likely to be found than in the storeroom. The ordinary manufacturer insists that his cash be kept exact to the cent, while hundreds of dollars' worth of material may lie around in different parts of the plant with no effective methods of safeguarding it, or even of showing when parts of it have disappeared. The extra trouble of keeping a stock system is usually paid for many times over by the

saving of stock and the practical value and convenience of being able to tell at any time just what stock is on hand and where it is.

As a rule, the best plan is to have one storeroom centrally located; this, however, is not always practicable. For instance, pig iron should be unloaded in the yards close to the cupola, and certain materials must sometimes be shipped direct to an operating department and not opened until used.

Power, Machinery and Processes

The information relative to machinery should include cost, floor space, and, in fact, all data necessary for the calculation of assignable indirect expenses.

It should be determined whether tests for power have ever been made, and if the conditions make it desirable, the tests should be brought up to date.

The general arrangement of the departments and machinery should be inspected very closely, with the idea of making the whole process as continuous as possible. Much time and money are wasted in rehandling material, when machines are placed in disadvantageous positions.

The average and maximum efficiency of machines should be known, and whether they are automatic or otherwise, This latter point is often important in arranging details for the gathering and compiling of costs. If a machine rate is to be used, the examination is, of course, more detailed and thorough than in the case of the productive labor method.

Labor

The number of men occupied in productive labor must be recorded for each department, and distinguished from those occupied on indirect labor. The entire labor force of

the plant must be classified in this way according to departments. The wages paid are not a matter for immediate consideration, though the method of payment is important, as it may make considerable difference in the design of time cards, and often in the method of distributing the indirect expenses.

The information regarding machines and necessary supplies must also be arranged according to departments, so that these items may be used in calculating the departmental indirect expenses.

Indirect Expenses

The last step is to classify all the general expenses so as to provide for an analysis by items. Expenses that can be connected with any particular operation should be distinguished from the general expenses; and expenses such as depreciation, insurance, heat, etc., should be dissected and apportioned over the departments and plant as a whole, according to the plan to be used.

Much of the data relative to labor, supplies, and general operating expenses may be found in the general accounting books, but whether or not the accounts in these books will be useful for classification of expenses depends entirely upon how they have been kept. When the accounts show the expenses well itemized and arranged, they may present valuable information which would otherwise have to be determined by estimate or experiment. The manufacturer may not care to have his whole bookkeeping system revised, and this should be borne in mind in arranging the details of the cost accounts.

Efficiency

In addition to collecting constructive information along the general lines mentioned, the examiner should

keep in mind many other considerations which relate to efficiency. Some of these have already been mentioned or implied, but it would be well to classify them along definite lines. They do not apply to any particular part of the examination; but every phase of manufacturing should be criticized from an efficiency standpoint.

Organization

The underlying purpose of organization is to bring each and every activity of a plant under the notice and control of the men responsible for its proper operation. Thus, in inspecting any department, its relation to the preceding and succeeding departments, and the methods by which its operations are reported and controlled by the shop manager, should be carefully studied. The whole field is so large that it is only possible to suggest certain necessary lines of investigation. For instance, storeroom facilities and the stock system in use, as mentioned before, should be reported upon, and the report should also cover part-finished stock, the assembling department, tool-room, patterns and dies, defective work reports, the method of requisitioning material and supplies, handling of time reports, inspection of work, the packing and cleaning departments, how production orders are issued and production reports made out, how the work is planned in advance, how excess time on operations is accounted for and how responsibility is defined. These and many other questions arise during the course of the examination, and none of them should be slighted.

Mechanical Aids

Besides the examination of the regular machinery, attention should be directed to the auxiliary mechanical service, which is a very important factor in running a shop

to the best advantage. This field, like that of organization, is wide; but the following subjects are suggested which may give rise to practical ideas: time clocks, time stamps, patent time cards, carrying belts, automatic counters, arrangements of yard service, factory telephones, mechanical devices in the office, standard jigs and dies, special arrangements for heavy or peculiar tools, etc.

Ventilation

The matter of heat, light, and ventilation is so important that it requires special attention. Bad air makes the workmen dull and listless, and everything drags, simply because there isn't enough oxygen on hand to supply the blood properly. Less work is done at a greater expense of effort.

Leaks

A watch should be kept for "leaks," especially in places where they may exist unnoticed. The wastes that appear in lost or spoiled material and time idled away are among the more prominent and more costly leaks. Large losses are sometimes incurred by failure to completely check material received, as in cases where barrels are not opened to see that they are full, etc. Spoiled material is likely to be concealed if there is not a system of material requisitions in use. Time may be lost through poor foremanship, especially where departments are not properly balanced, and where the men in one department wait for another department to send work to them.

Time lost in carrying materials, crowding of aisles with goods, scattering of men's time on odd jobs, unnecessary consumption of power, waste of scrap material, inconvenience in location of tools and dies, poor toilet facilities, etc., are all signs that losses are being incurred which, al-

though small in any special case, amount to considerable sums when spread over a whole factory for a period of time.

The examiner should also take note of all places where the work seems to be going on half-heartedly. Such places will require attention and perhaps special measures, but the returns will justify it.

Summary

While the examiner's mind is occupied with the active details of his examination, he must be subconsciously considering how each feature that develops is going to find a place in the cost system, and what special modifications are needed to make the system fit the conditions. Thus his information is of two kinds: first, the constructive information necessary to the designing of the system; and second, a critical knowledge of the defects and inefficient spots that need immediate attention. It must not be thought, however, that an examination will discover anything but surface defects; it remains for the cost system itself to detect and locate those beneath the surface.

Details of Examination Information

It is suggested that the examiner have with him a schedule of questions which will serve both to classify his information and to keep him from overlooking more or less important details. The questions which follow, while suitable for this purpose, are not expected to cover every possible condition. The examiner in charge will be able, however, to cover the greater portion of the investigation by use of these queries and instructions, and to supplement them when necessary. It is impossible to obtain too much information, and nothing is too unimportant to notice.

Schedule of Questions for Examination of a Plant

(1) Purchase Division

1. Are purchases made on verbal or written requisitions? Give full particulars.
2. Is there any one responsible head, or are purchases made by several? Particulars.
3. Are complete records made of quotations received?
4. Is any accounting done in this division? If so, describe it.
5. Describe filing methods, including catalogues.
6. Are any orders placed verbally? If so, are they promptly confirmed in writing?
7. Obtain copies of all forms and books used.
8. Give office force and duties of each.
9. Remarks.

(2) Receiving Department

1. How are incoming goods handled?
2. Are there any mechanical appliances? Describe.
3. What records are maintained?
4. Is there a track scale and a car record kept? If not, how are car-loads received and checked out?
5. How are partial shipments checked up and reported?
6. Is trucking equipment owned? What sort?
7. Obtain copies of report or record forms, books, etc.
8. If any goods are returned, how is accounting handled?
9. How are overs, shorts or damaged goods reported to purchasing department?
10. Remarks.

(3) Storeroom

1. Are storerooms maintained for all raw materials and parts?

2. How many, and where located?

3. Do employees have access to stores?

4. Are heavy goods conveniently arranged as to classes and convenience of handling? Are they properly marked or tagged, and are there signs or other methods for locating classes?

5. Are there any mechanical devices such as trolleys, tiering machines, cars, etc.? If so, describe.

6. Are there bins, shelves, racks, etc., of sufficient capacity, and are they arranged to best advantage for economical handling of goods?

7. Are bin cards used?

8. Are parts manufactured and carried in stock?

9. Could any such parts be purchased for less money?

10. Is raw material carried in stock after passing through a process? If so, describe and state why.

11. How is the quality of goods tested when received?

12. What checks are maintained as to correctness of deliveries to manufacturing departments?

13. How are such deliveries made, and are there tote boxes or other standard devices used?

14. Are all deliveries covered by requisitions? If not, note exceptions and reasons.

15. Does storekeeper have copies of all standard bills of material or specifications?

16. Are factory supplies furnished to departments on requisition? If not, how handled?

17. Are obsolete parts or surplus stock reported regularly to the management?

18. How are returnable containers handled and accounted for?

19. How does storekeeper request purchases?

20. Is a perpetual inventory maintained, and, if so, how verified?

21. Does such inventory show quantities only, or values and costs as well?

22. How many employees, and what are their duties?

23. Does department appear to be efficiently handled?

24. How does storekeeper handle excess materials issued and returned to stores?

25. Obtain copies of every form or record.

26. Remarks.

(4) Dry Kilns

1. Type of kilns used; *i.e.,* direct heat or vapor process? Describe equipment and manner of operating.

2. Is exhaust steam or live steam used?

3. Is lumber measured or weighed in and out? If not, how is quantity dried accounted for?

4. Is there any special fire protection? If so, what?

5. How far away from factory buildings are dry kilns located?

6. Is any attempt made to record cost of drying? If so, state particulars.

7. How many employees, and what are their duties?

8. Obtain copies of forms, if any.

9. Remarks.

(5) Power Department

1. Obtain list of equipment, stating number, kind and capacity of engines, boilers, dynamos, pumps, heaters, economizers, traps, condensers, etc., etc.

2. Is equipment kept in thoroughly good condition?

3. How frequently are boilers cleaned?

4. Is there any reserve capacity?

5. Is equipment deficient in any respect? If so, particularize.

6. Are there any special safeguards against accidents?

7. Is the power plant in one unit, or in two or more units? Describe each, if more than one.

8. Is factory heated from central power plant?

9. Is any record kept of power and heat distribution?

10. Is any record kept of light distribution?

11. Is any record kept of air distribution?

12. Is any record kept of engine efficiency?

13. Is any record kept of fuel consumption?

14. Is exhaust steam returned to boilers?

15. How many employees, and what are their duties?

16. Obtain forms.

17. Remarks.

(6) Manufacturing—General

1. Obtain list of articles manufactured, or furnish catalogue.

2. How many plants, and where located? Describe.

3. Are any other plants controlled by the concern? If so, explain relations and how handled.

4. Obtain sketch of floor plans of plant being examined and indicate space occupied by each department. Obtain blueprint if possible.

5. Obtain land area, and how occupied.

6. Is plant owned or rented?

7. Could plant be improved as to arrangement without undue expense?

8. Is any record kept as to maintenance of buildings and machinery?

9. Does such record apply to buildings and machines separately, or is it in bulk?

10. Are there special fire hydrants, standpipes and hose?

11. Are they inspected frequently and kept in good order?

12. Are there any fire-drills?

13. Are there ample fire-escapes and exits?

14. Are they kept clean and readily accessible?

15. Does superintendent appear to be qualified to handle the plant without interference?

16. Is he given full authority, or is his authority limited in any way? Give particulars.

17. Are duties of all foremen and assistants well defined and thoroughly understood?

18. Are departments properly balanced? If not, give reasons.

19. Are there any time-clocks, and are employees supervised when they ring in and out?

20. Are any mechanical devices used for keeping time on jobs? If so, describe.

21. Is there any special system of interdepartment conveyance? If so, describe. If not, or deficient, state improvement necessary or desirable.

22. Is there a good system of shop telephones?

23. Does production consist of standard lines, special orders, or both? State proportion of both.

24. Are orders for standard lines put through for considerable quantities of finished product or for parts to be assembled as wanted?

25. Is there any system of planning work in advance? If so, describe it.

26. How are orders made out and put in work?

27. Are sub-orders or tags made out, or does original shop order follow the work?

28. How are orders numbered or identified?

29. What is the sequence of travel or routing from department to department?

30. Are there any daily reports of progress made? Describe.

31. How is production reported and verified?

32. Are completed orders checked with originals to verify instructions or to compare estimates of time and materials?

33. How are the interdepartment orders handled; *i.e.*, orders for work in form of repairs, or other items not directly concerned with production?

34. How is experimental work handled?

35. Are any parts interchangeable, and to what extent?

36. Is finished product shipped out as completed, or carried in stock?

37. Are individual records kept concerning late and absent time of men?

38. Do they have any strikes or other labor troubles of consequence?

39. How is waste material treated?

40. Obtain forms and books.

41. Remarks.

(7) Manufacturing Departments

Obtain the following information for each department, so far as the questions apply, and supply any additional data necessary to cover requirements fully:

1. Name of department.

2. Name of foreman.

3. Number of employees.

4. How many piece-workers? How many day-workers?

5. How many non-productive workers? Obtain any desirable information in this connection.

6. Does foreman appear to be competent?

7. Has he any assistants?

8. Are instructions given to workers verbally or in writing?

9. Are blueprints or drawings furnished in all cases where desirable?

10. Obtain list of machines in this department and their uses where name will not clearly indicate their purpose.

11. Mention any that are automatic or semi-automatic, and describe groups operated by one person or team.

12. Are any machines obsolete or inefficient? If so, name them.

13. Are machines arranged to best advantage for economical operation? Suggest improvements.

14. Are there any high-speed machines or tools used? If so, indicate them.

15. Are such machines operated as rated by makers, or have any attempts been made to increase their efficiency?

16. Are there counters on any machines? If so, indicate them and mention other machines where counters would be useful.

17. If tempering or heating furnaces are employed, state for what purpose, what kind of fuel used, and describe operations.

18. Are all machines numbered?

19. Is there a separate tool-room?

20. Are tools numbered or catalogued?

21. Is there a good tool system for checking tools? Describe.

22. Do workmen keep own tools in repair, or is there a toolmaker employed for that purpose?

23. Are machines and transmission appliances guarded to protect employees against accidents?

24. Are there any tool or pattern maintenance records?

25. Are there any efficiency records in connection with either men or machines?

26. What sort of power is employed in this department and how distributed; *i. e.*, by individual motors, group motors, a single motor, or direct from line shaft?

27. Is there any record of power cost either for department as a whole or as applied to machines?

28. Is natural lighting good? If deficient, explain why and—if possible—suggest improvements.

29. Obtain complete list of operations performed in this department, indicating hand and machine work. Describe any that are out of the ordinary.

30. Are operations standardized as to time, machines, speed, tools, etc.?

31. Report on what may be defective methods of performing operations, suggesting improvements where possible.

32. Describe timekeeping system.

33. Is there any lost or idle time? If so, explain why.

34. Is there any bonus or premium system in force?

35. How are materials obtained and charged to production?

36. Is it necessary to issue materials in excess of immediate requirements at times? If so, how is the excess cared for?

37. How is defective work reported and disposed of?

38. Are there any methods in vogue to prevent the replacing of materials that have been spoiled?

39. Do requisitions for replaced material indicate the purpose of the withdrawal?

40. Is there any undue waste of material or time? If so, is there any apparent remedy?

41. How is legitimate waste material disposed of? If used again, describe.

42. Is all work properly tested or inspected?

43. Is work inspected by operation, or only when completed?

44. Are there any delays due to faults of other departments? If so, describe them.

45. Is any attempt made to keep shop in any constant degree of humidity? How is it ventilated?

46. If manner of reporting production or progress in this department differs in any way from others, specify how.

47. How are parts, belonging to repair jobs, stored and marked?

48. Are any samples made for show-rooms, demonstration or salesmen? If so, how handled as to accounting?

49. Is there any friction or dissatisfaction of any sort? If so, explain.

50. Does the department appear to be efficient as a whole, or is there an indication of laxity?

51. Obtain copies of all forms.

52. Remarks.

(8) Repair Department

Examine on same basis as manufacturing departments.

(9) Foundry

Apply same inquiries as used for manufacturing departments as far as they will fit, and, in addition, ascertain various classes of moulding, viz., machine, snap, floor, pit, regular bench, etc., and the various classes of output, the character of mixtures, if mixtures vary in same melt, number of melts per week, cleaning process, manner of making calculations at present, manner of ascertaining production and waste in a steel foundry, whether work is

planned in advance, whether flasks, rigging and tools are cared for and placed conveniently for use, whether iron or wooden flasks are used, noting any special methods of moulding, condition of cupolas, furnaces or other equipment, etc.

(10) Plating-room

Same inquiries as for manufacturing departments to be used wherever applicable. Ascertain whether anodes or salts are used and how consumption and amount of deposit is ascertained. Note any special processes, and also quantities of small pieces immersed on one hanger, difficulties encountered, etc.

(11) Wood-working Shops

The same line of investigation as outlined for manufacturing departments should be pursued, bearing in mind that wastes and consumption are the most puzzling features of such departments or plants. Ascertain particularly from an accounting standpoint the methods employed for determining consumption, and the treatment of wastes suitable for further use.

(12) Assembling

1. State fully nature of work performed in this department and methods pursued.
2. If any packing is done here, describe it, and furnish information as under "Packing Department."
3. How many employees, and how distributed?
4. Does piece or day rate plan prevail?
5. Is work done by individuals or by teams?
6. What record of time is kept?
7. Is department efficient, or otherwise?
8. If otherwise, how can condition be remedied?

9. Are there any machines or mechanical appliances? If so, list them and describe uses.

10. Is any final inspection or test made here?

11. How is the product disposed of after its completion?

12. Obtain copies of all forms and books used.

13. Remarks.

(13) Packing Department

1. What sort of package and packing materials are used?

2. Are packages made or bought?

3. How are packing materials, nails, twine, wire, etc., taken out of stores; *i. e.*, by requisition or otherwise?

4. How are values of above ascertained, and how applied to shipments?

5. Number of employees and their duties.

6. How is time recorded and applied?

7. How are deliveries made to shipping department and how accounted for?

8. Obtain copies of all forms used.

9. Remarks.

(14) Shipping Department

1. How are shipments checked out?

2. What records are kept and what reports are made to general office?

3. Are shipments made from own siding or trucked to railroad stations?

4. How are partial shipments handled?

5. Any mechanical aids?

6. How many employees and their duties?

7. Obtain copies of all forms and books.

8. Remarks.

(15) Sales Division

1. Explain manner of selling product.
2. Amount of sales annually?
3. Are sales evenly distributed over the year, or are they made in seasons? Explain.
4. Are sales classified, and, if so, how?
5. Are any branch warehouses, offices or agencies maintained? If so, describe, and how handled.
6. Any mail order business? Explain plan, if any.
7. Any retail department? Describe how handled.
8. How many salesmen employed—on salary or commission?
9. Any records of salesmen by territory?
10. Any records of profits on sales of each man as above?
11. Are statistics as to sales and salesmen compiled regularly or only at intervals?
12. Any advertising plan? Describe it and the records kept.
13. Describe follow-up system, if any.
14. Describe filing system.
15. Describe freight rate records, if any.
16. Give office force and duties of each.
17. Obtain copies of all forms or books, including route lists, salesmen's reports, expense accounts, quotation records, etc.
18. Remarks.

(16) General

1. Capital stock? Is it common, preferred, or both?
2. Any unissued or treasury stock?
3. Any bonded, mortgage or other funded debt? State class.

4. Give names of officers or members of firm and their duties.

5. What records are kept by each, aside from those mentioned below?

6. Give heads of departments in general office and their duties.

7. What records, if any, are kept by each?

8. Any friction between officers or heads of divisions? Causes.

9. Any lack of organization or facilities in general office?

10. Mail and correspondence—how handled?

11. Stamps—how handled and controlled?

12. Filing and card index system, and how handled?

13. Divisions, number of employees in each and their duties.

14. Forms and books used in each division, with explanation as to how used.

15. Methods of accounting, including basis of closing, and ascertaining of profit and loss.

16. Classification of accounts, with explanations.

17. Billing system—explain fully.

18. Collection methods and records.

19. Stationery records as to costs and manner of issue.

20. Are any plant, pattern, tool or employees' records maintained? If so, explain.

21. Pay-roll, how made up? Are receipts taken from employees? Explain with reference to both office and factory.

22. Do manufacturing accounts interlock with general ledger?

23. Is clerical work up to standard and kept up to date?

24. Is there any cost system in operation? If so, obtain full particulars, especially with reference to methods

of distributing shop-burden and general overhead, and method or routine of collecting and tabulating figures to obtain costs.

25. What objections are offered, if any, against the introduction of improved accounting and efficiency methods?

26. Remarks.

The method employed to record the information obtained from the physical examination of a plant depends entirely upon the individual conducting the examination; but a convenient plan is for the examiner to spend the forenoon of the day in the examination of one or more departments, making notes of the information received, and in the afternoon to write up in detail the result of the examination. Thus it is possible to review the morning's work while the details are still fresh in mind, and to add any information that may have been overlooked in the first place.

Tuesday, Dec. 19,

CHAPTER XI

DEVISING A COST SYSTEM

Co-operation of Management and Employees

After the plant has been thoroughly examined, and all the information has been classified according to the different phases of cost-finding, the next problem is to devise a system that will perform its twofold function and at the same time be practical in its workings. There are often many conditions outside of the manufacturing part of the plant that have an important bearing on the situation. Not least among these is the disposition of the manufacturer himself and his assistants. It is next to useless to try to install a system that is going to be regarded with suspicion and criticism before it has had a chance to prove its worth. To get the best results the co-operation of the whole force is needed.

The foremen and department heads are often the most persistent objectors, as they are likely to regard the installation of a cost system as an invasion of their territory. They are right to the extent that the system provides an effective means of examining their work and measuring their efficiency, in a way that cannot be done by personal inspection. The usual shortcomings of a foreman are to be found in his failure to plan ahead properly and lay out work for the men under him, and the time reports will show his deficiencies in this respect. To illustrate, the time-clock cards may show that the men were present 900 hours during a week, while

the time reports, which indicate the time spent on jobs, may show only 800 hours for the same week. Under a cost system this cross-checking of time records should never be omitted; and if a difference exists, the foreman should be called upon to explain the discrepancy.

Fitting the System to Existing Conditions

Much depends on whether the employer is willing to engage a special cost clerk or not. If the work is to be undertaken by the regular office force, the system must be one they can handle; and this involves a very simple system when the office clerks are not particularly capable. More will be accomplished by generalizing results in such cases than by putting in a complete system, which is bound to break down because the clerical force cannot handle it.

In other words, the cost accountant must work along the lines of least resistance, and begin with as simple a system as possible, amplifying this and adding new features as the conditions allow. This is the reason for introducing at first an "Estimating" system, which will serve its own purpose and also soon show where more complete methods should be applied. The size of the plant and complexity of the work will of course have some influence on the system, both in the beginning and during its growth. It cannot be hoped that an elementary installation will give satisfactory results where there are many varieties of articles manufactured, or where the processes are numerous or involved.

The growth of a system is not necessarily toward complexity. Very often, after a factory is well organized and the efficiency work of the cost system beginning to show results, features that were at first treated separately may be included in larger units, and much detail labor avoided. The system at first must fit existing conditions; but one of the objects in view is to change conditions for the better,

and when this is done the system itself may be changed accordingly. There are conditions, too, that remain comparatively constant from year to year; and when a cost system has obtained the results by detailed methods for one or two years, that part of the system may be dropped and the results considered as a constant quantity. There is little benefit in verifying established data, especially if the verification is involved or expensive and can be accomplished approximately by other means.

Red Tape

Whatever kind of system is devised, every precaution should be taken to avoid making it top-heavy. If there is one thing more than another that excites criticism, it is "red tape" that does not justify itself in practical results. It may show itself in a mass of undigested reports, troublesome to make up in the shop and impracticable to use in the office, or it may take the form of volumes of data that no one ever looks at. Another form of red tape, not uncommon, is carrying small items of cost to such a degree that the process of determining them is more expensive than the costs themselves.

In avoiding these pitfalls, the cost expert will sometimes appear to be violating the fundamental principles of cost-finding, when, as a matter of fact, he is only preventing them from going to seed. The last point will bear illustration. In manufacturing straw hats the material costs appear under five heads: the braid or straw, the band, the sweat—which is the leather inside—the trimmings, and the thread. Under a special order system the only practical way to treat the thread is to put it in the general indirect expenses and distribute it over the hats without regard to their grade or value. The expense of finding the cost of the thread entering into any particular grade of hats would be greater than

the cost of the thread itself. Similar instances can be cited in many industries.

Reports for Executives

The systematizer must keep in mind what the practical objects and purposes of the cost system really are. The system itself is not the result; it is only the means by which results are obtained.

If the cost system is to be the measure of shop efficiency, thought will have to be given to the form in which the results should appear. The record to be used to show these final results is the comparative analytical statement prepared at the end of every cost period, in which the expenses are classified. The comparison may be made by parallel columns or by comparing different sheets. Sometimes the various expenses are plotted on charts so as to show at a glance the upward or downward tendency. The completeness of the classification depends upon the completeness of the system, and, as stated before, this depends on a number of considerations. The idea is that the manager should be able to put his finger on any variations in any item of expense relating to any class of goods or to any department, and either know the cause or be able to investigate and discover it. Not only can variations be studied, but each item may be considered by itself with the idea of applying a remedy if needed. In short, an adequate report of cost results serves as the key to the whole situation, giving the management positive knowledge of the facts as they are.

Cost Period

One feature that must be decided before actual arrangements are made for installing a system is the cost period. This is the unit of time for which costs are to be summarized and reported, and usually covers a month. It is advisable

to have the cost period coincide with the pay-roll periods as far as practicable, so that the closing days will agree; that is, if the men are paid by the week, the cost period may be four or five weeks. In this way calculation of wages due but not yet paid will be avoided, and the distribution of costs simplified.

General Outline of Systems

The systems described in the following chapters have been selected with the idea of illustrating the principles of cost accounting applied to the general types of systems outlined in Chapter IV. As far as possible, the systems have been made general rather than specific, in order to provide for flexibility in adapting them to actual conditions. In any particular case the system adopted will probably require some modification, which, while not affecting its general plan, will apply its principles in a different way. The aim in each instance must be to make the system practical in its operation. Much of the opposition and criticism that cost systems have incurred is due to too much enthusiasm and too little common sense in their planning. The system has been placed ahead of the business.

There is nothing presented in these chapters, in the way of either methods or designs, that has not met with success in actual operation. They do not merely represent what might be accomplished, but what really has been done.

Estimating Cost Systems

In Chapter XII is presented a graded series of "Primary" or "Estimating" cost systems, which will locate the causes of faulty or erroneous estimates. Besides having obvious values of its own, an estimating system will indicate along what lines a more detailed cost system should be applied, if that is desirable. As an efficiency agent, however, the

estimating system is of little use, since it does not provide for reporting the work of the shop in detail.

Departmental System

In Chapter XIII methods of finding the cost of different classes of product by the class are described under the title "Departmental System," the word "Departmental" referring to the classification of product, and not to the operating department. It is an intermediate step between the primary or estimating and the complete cost system. The costs of a particular class are found, but are not analyzed beyond the principal divisions. Under such a system the danger is that some articles of a class may be manufactured at a loss, and the loss be concealed by the profit on other articles of the same class, while the class as a whole shows a profit. When the classification is simple in character, however, a departmental system may often be used to great advantage, since much of the detail work of a complete system is eliminated.

Special Order and Product Systems

The four systems described in Chapters XIV to XVII inclusive illustrate in each case one of the four general types referred to in Chapter IV. The descriptions themselves are given from an accounting standpoint, since the system of accounts is the key to the system of operations. The conditions to which each system applies are outlined at the beginning of the chapter in which the particular system is described.

To avoid confusion, only two methods of distributing the indirect expenses have been used, the direct labor cost and new machine rate. Each method is given in connection with both a "Special Order System" and a "Product System." If the principles are well understood, there should

be little difficulty in changing the forms and classification of accounts, so as to provide for any other method of expense distribution.

Attention should be called to the necessity which often exists of combining different methods in the same plant. For instance, in either a stove works or a tannery the first few operations are best covered by a product system, while at a certain stage the manufacture breaks off abruptly into what is essentially a special order business. There are also many instances where part of a plant must employ a productive labor method, while the rest can only be treated rationally by machine rates. Such cases, especially the former, call for considerable ingenuity in welding the two systems of cost accounts into one without loading it with extra details.

In presenting the four cost systems, no attempt has been made to include all the organization forms, some of which are essential for a cost-finding system conducted on a systematic basis. The systems as presented are intended to illustrate, as far as possible and without too great detail, the best methods for compiling the cost data intelligently and accurately and interlocking the cost accounts with the general books.

In explaining and describing the forms for gathering and compiling the cost data in the different systems, some repetition has been unavoidable in explaining the application of the same principles or forms under different conditions. Where such repetition occurs, it is only for the purpose of making the matter clear without too frequent reference to other parts of the book.

Charts of Cost Systems

The charts of the four cost systems, which appear in connection with the descriptions of these systems, are de-

signed to show in concise form the course of the entries on all records and accounts affected. These charts, in connection with the explanations of the forms and records, give a clearer and more comprehensive understanding of the detailed workings of the system than could be obtained otherwise.

The charts are each divided into three main divisions, showing:

(1) A general description and classification of the entries which affect both the subsidiary and the controlling records

(2) The course of the entries on the subsidiary forms and records

(3) The method of control, and the entries affecting the controlling records

General Description of Entries

The entries of a cost system may be classified under six divisions:

(1) Authorizing the purchase of materials and supplies, and the incurring of other expenditures

(2) Receiving, storing and requisitioning of raw material and supplies

(3) Putting raw material into operation

(4) The compilation of cost data on the cost sheet

(5) The transfer of finished parts or finished stock to their respective stock records, and also the transfer of part-finished stock back into operation to be completed

(6) The shipment and sale of finished stock or part-finished stock, and also the return of finished

stock or part-finished stock, including the entries upon the register of sales and costs

By means of these six classifications, one can very readily see:

(1) The detail records affected
(2) The controlling accounts affected

Subsidiary Records

The subsidiary records on the charts are represented by rectangles upon which are entered the names of these records and also their numbers.

The course of the entries upon the subsidiary records is denoted by means of arrows which show:

(1) The source from which the information is obtained; and
(2) The disposition of the information

Method of Control

The division of the charts on which appears the method of control of the subsidiary records is classified so as to show the posting medium, the factory ledger accounts affected—if a factory ledger is used—and the general ledger accounts affected.

Under the caption "Posting Medium," those records are mentioned from which postings to the factory ledger and general accounts may be made. It should be borne in mind, however, that the entries affecting the factory ledger may be entered in a cost journal, and postings may then be made from that source.

Under the captions showing the accounts affected the entries are in journal entry form.

Forms and Designs

When it comes to the question of choosing or designing the forms to be used in any particular case, it is impossible to exercise too great care and foresight. The matter is one that cuts deeper than is apparent at the first glance. Fundamentally, a form is determined by the question, "What do I want to know?" Not only the form but the system to be adopted depends on the answer to this question. The next question is, "How can the facts best be obtained, summarized and arranged, so as to get the most out of them with the least trouble and expense?"

This cannot be answered until the type of system to be installed has been decided upon. The whole system should be arranged so that its several parts will fit in the scheme naturally and conveniently.

Forms have not been provided in all cases for summarizing purposes. In many cases this may be done on the form upon which the original data is compiled, and where this is not practicable, blank paper with ruled columns will answer the purpose.

The forms for gathering the data at first hand should be designed with the idea of getting the necessary information with the least disturbance to the workmen and to shop routine consistent with accuracy.

Forms, as a whole, may be arranged so that they may be used for more than one purpose. For instance, the material requisition sheet is customarily made out to show the amount and cost of material entering into any given production order, but the information recorded there may be just the information needed in connection with keeping a stock record. This double purpose of the form is accomplished either by making the form more general or inclusive in design, or by making extra copies. In actual practice the

scope of forms is limited by their respective uses. That is, the same data should not be collected over and over again. The forms as described in this book overlap because it is necessary to show what uses can be made of each form—not what uses should be made.

The forms submitted are limited in number; and with this in mind, they have been carefully selected rather as suggestions to work from, than as examples from which to choose.

A careful inspection and comparison of related forms will often suggest the minor changes necessary to adapt them to other kinds of systems. Adding a new column or changing the classifications will often enlarge the scope of a form more than would seem possible.

No attempt has been made to explain completely all the functions that each design could perform, the object being to cover only the main functions it performs in the system under consideration. Wherever more information is desired as to the general use and purpose of any particular form than is given in the system described, reference should be made to the chapters relating to the recording and compiling of the cost data.*

The forms presented in Chapters XVIII to XXII, inclusive, are also supplied under separate binding, so that the reader may have them conveniently before him when they are to be consulted in connection with the text.

*Chapters VII, VIII.

CHAPTER XII

ESTIMATING COST SYSTEMS

Purpose and Kinds

The estimating cost system is used for verifying estimates of the cost of production and for locating mistakes in the estimates. How well its purpose is realized depends on the degree of refinement with which the estimates are made and on the records kept to verify them. Three plans or grades of estimating systems are presented here, ranging in scope as follows:

(1) Verification of estimates on the total amounts of the material, labor, and indirect expense

(2) Verification of estimates on material and labor classified by departments or operations, together with the total indirect expenses not classified

(3) Verification of estimates on each class of product according to departmental material, labor and indirect expenses

Advantages

The good features of estimating cost systems are three in number. First, the clerical work is comparatively small compared with that involved in a complete system; second, the estimating system often discloses weak spots in the estimates, and indicates where complete methods should be introduced; and third, it may be used with good success in

small factories, or in larger plants where the product does not represent a wide variety of articles.

First Plan of Estimating Costs

In the simplest and most elementary estimating cost system, there are but three forms used:

(1) Schedule of Estimated Costs
(2) Inventory Sheet
(3) Analysis of Cost of Sales

Schedule of Estimated Costs (Form 52)

This form is specific in character, and provides for the total estimated cost of each kind of article manufactured, divided into the three elements, material, labor and indirect expense. The estimates that appear in this schedule are to be used in pricing the inventory and cost of sales. The figures should remain constant until the verification has shown them to be inaccurate, when they should be revised, and the revised figures used at the beginning of the new period.

The form may be provided with extra columns to show variations from period to period in the elements of cost; but such variations should not be incorporated in the other forms of the system until a new inventory is taken at the beginning of a new period.

Inventory Sheet (Form 61)

The "Inventory Sheet," based on the schedule of estimated costs, shows the estimated cost value of all the product in the plant divided into its elements; that is, material, labor and indirect expenses. In the case of raw material, the cost appears only in the material column. The cost of articles in process is estimated as closely as possible. The

errors that may exist in such an estimate will probably be cancelled by the same errors in the ending inventory, and will not be appreciable unless there is a great difference in the amount of materials in process in the two inventories.

The totals of the three elements of cost are posted from the inventory sheet to the ledger to the debit of their respective accounts at the beginning of the period, and serve to open these accounts upon the books.

Analysis of Cost of Sales (Form 65)

In order that the estimates may be verified, a record must be kept of all articles sold and the quantity of each, this information appearing on the analysis of cost of sales. The costs of the articles are entered and classified on the analysis of cost of sales in the same way as the costs on the inventory sheet. By adding the several columns, the total of each element of cost as estimated is shown for each article sold.

Verification Under First Plan

It will be noticed that the totals of each of the elements of cost are debited to their respective accounts from the inventory sheet at the beginning of the period. During the period all expenditures for material, labor and expense should be charged against the proper accounts; and in doing this great care must be exercised to keep the original classification unchanged; *i. e.,* the items charged to the labor or indirect expense account must include only the items that were considered as labor and indirect expense charges in making the schedule of estimated costs. If there is any change in the classification, the validity of the whole plan is destroyed. Only the totals need be considered in posting to the accounts for material, labor and indirect expense.

It is clear that the debit side of the three accounts rep-

resents the estimated value of the inventory at the beginning of the period, plus the actual expenditures relating to these accounts for the period.

The totals of the material, labor and indirect expense columns on the analysis of cost of sales are credited to their respective accounts in the ledger. The balance of these accounts will be in effect a book inventory classified in the same way as before, and based partly on the estimated beginning inventory, and partly on the actual charges incurred during the period. The next step is to take an actual inventory at the end of the period based on the schedule of estimated costs.

It is obvious that the book inventory will agree with the physical inventory if the estimates are correct. Any difference shown between the two is due to inaccuracies in the estimates. If any element in the book inventory exceeds the corresponding element in the physical inventory, it shows that the estimated costs were too low as regards that element, and if the reverse, the estimated costs were too high, provided of course that there has not been any theft or waste of the stock.

The manufacturer must judge from the amount of the differences where the trouble lies, and to what extent the estimates should be revised. For instance, if the material costs are considerably underestimated, it is probable that leaks of considerable importance exist in the methods of handling and safeguarding the material, or that wastes occur in the processes. If the estimates for labor are much too low, the cause may lie in the classification of labor; that is, labor that is really direct may have been classed as indirect. The principal difference, however, is almost always found in the indirect expense account, since comparatively few manufacturers calculate all the phases of overhead cost in their estimates.

If the cause of the differences cannot be found, the estimates should be revised on the basis of the known conditions. No method of revision will give the exact figures, but if the difference between any corresponding elements in the book inventory and physical inventory be divided by the number of units of product manufactured during the period, the result will be, approximately, the amount to be added to or subtracted from the original estimates relating to that element. This rule is fairly accurate provided no changes have occurred in the methods and routine of manufacture since the original estimate was made.

When the material, labor and indirect expense accounts are credited from the analysis of cost of sales, the total of the three elements as shown by the total column on the analysis of cost of sales is debited to the Sales account. The balance of the Sales account will then be the estimated gross profit or loss. If the book inventory exceeds the physical inventory, showing that the estimates were too low, the difference should be credited to the Inventory account according to its proper classification, and charged against the Sales account. If the estimates were too high, the entry would be reversed; *i. e.*, the Inventory account should be debited, and the Sales account be credited. The balance in the Sales account will then show the true gross profit or loss instead of the estimated figure.

Monthly statements may be prepared based on the estimated costs, the differences being adjusted at the end of the inventory period. The monthly statement, however, is likely to be misleading unless the estimates are fairly accurate.

If such a system of verifying and revising estimates is followed up, it will sooner or later bring the estimates close to the true costs. But it will often be necessary to locate and correct seeming inaccuracies in the cost estimates. To do this, the estimates will have to be made by departments or

operations, and the plan of verification will have to be extended to meet the divisions in the estimates.

Second Plan of Estimating Costs

The second plan provides for the departmental classification of material and labor; but in order to avoid the clerical work necessary for distributing and determining departmental indirect expenses, that element is still treated as an unclassified whole, covering the entire factory.

The " Schedule of Estimated Costs," "Inventory Sheet," and "Analysis of Cost of Sales," are used in the same way as before, but the material and labor estimates are divided into as many sub-heads as there are departmental classifications.

To accomplish this, the following additional details should be shown on the three forms used in the first estimating method. On the inventory sheet should appear the heading "Department"; and columns should be ruled under the captions "Material" and "Labor" for the number of operations under each classification, and also a column for indirect expenses and a column for the total cost. The same captions and columns should appear on the schedule of estimated costs and analysis of cost of sales.

Besides these three forms, the system requires a purchase journal and a pay-roll form for dissecting and arranging the material and labor cost.

Purchase Journal (Form 5)

When purchases of material are made, they are classified in the purchase journal according to the sub-divisions under the head of "Material." The purchases are credited to the accounts of the creditors and charged in total at the end of the month or period to the account appearing at the head of the column.

Pay-Roll (Form 38)

The entries on the pay-roll are classified into direct labor for each operating department, and columns are also added to show the indirect labor, supervision, etc. The totals of the direct labor columns are debited to the department labor accounts; and the totals of the other columns are charged to the proper accounts under indirect expenses. If certain items of indirect labor are made a part of the estimates for labor cost, these items must be separated from the rest and entered under the same labor classification as in the estimates. Otherwise the comparison will not show dependable results.

Verification Under Second Plan

The plan of verification is the same as in the first system, and precisely the same steps are followed in locating and adjusting discrepancies. The only different feature is the number of accounts involved. By using the department accounts, sources of errors and leaks are often located that would be concealed in the first plan.

While the system of cost-finding just described localizes costs to some extent, there are many important facts that it does not disclose. For example, it may be known that a profit is being made on the product as a whole, but it may also be suspected that certain articles or classes of product are being sold at a loss, and that this loss is being paid out of the profits on other goods. This is a condition existing so often that it may almost be said to be prevalent.

Third Plan of Estimating Costs

The third estimating system is devised to solve the problem just mentioned by making an analysis of estimates, primarily by class of product, and secondarily by operating department. As might be expected, there is considerably

more detail work than in the other two plans, although the underlying principle of verification is the same.

The forms used are:

Schedule of Estimated Costs
Inventory Sheet
Analysis of Cost of Sales
Purchase Journal
Material Requisition
Summary of Material Requisitions
Time Report
Pay-Roll

Schedule of Estimated Costs

The "Schedule of Estimated Costs" is the same in design as that used in the second plan, the sub-heads under "Material" and "Labor" referring to different operating departments. The estimates, however, are classified according to the nature of the article.

Inventory Sheet

The "Inventory Sheet" is the same form as the one used in the second plan, but separate inventory sheets are used for each class of product, and the raw material not yet put in process is not included in any class, but is inventoried by itself. The total amount of raw material is charged to a separate account in the ledger, and this account is credited with the raw material drawn out on material requisitions.

The finished and part-finished stock are entered as before, each article on its proper sheet. The totals appearing on each inventory sheet then represent the total estimated cost of all articles belonging to that class of product.

An account is opened in the ledger with each class of product, and with the various sub-divisions of expenditures

relating to it, viz.: the departmental accounts for material and labor, and one account for indirect expenses.

Analysis of Cost of Sales

This form is the same as that used in the second plan; but separate sheets are used for each class of product, and the inventory classification must be rigidly adhered to.

Purchase Journal (Form 5)

This record is to be used for the purpose of entering invoices for goods purchased, and differs from the form used in the preceding plan only to the extent that one column for raw material is used in place of several, as material requisitions are to be used in connection with this plan. All material purchased can now be charged to one account, the distribution to the respective departments being made from the material requisitions. The total purchases of material for the month, exclusive of supplies in the nature of an expense, should be posted to the debit of the Storeroom account, which account has been previously charged with the inventory of raw material at the beginning of the period.

Material Requisition (Form 20)

The material requisitioned out is credited to the Raw Material account and charged to the proper class of product in the Material account for the department drawing the material. The form should state the date, the department, and the order number, or give some similar information indicating the class of product, as well as the name, quantity and cost of the material asked for.

Summary of Material Requisitions (Form 24)

It may save time in posting if the requisition sheets are classified and summarized on a summary sheet for entry

to the journal or ledger accounts. The form is generally analyzed according to departments, the different classes of product being the sub-heads. Thus, by adding the totals of the first columns under each department, the total material cost applying to the class of product represented in that department is obtained. The posting may then be made in totals for each account at the end of the month or inventory period.

Time Report (Form 26)

The time report must be designed to show the department, classification number or other indication of class of product, besides the name of the employee, date, time or quantity, rate and amount. Each employee engaged in direct production work in any way should make out such a time report for the work in hand.

Pay-Roll (Form 38)

The pay-roll is used to summarize and classify the time reports so that the proper charges may be made against the various direct labor and indirect labor accounts. A separate sheet should be prepared for each operating department, with sub-heads referring to the different classes of product operated upon in that department. The complete pay-roll is thus dissected both by department and by class of product, and the charges can be made accordingly. It may save time, however, if the pay-roll as analyzed is entered in the cash book and posted directly to the debit of the accounts affected.

Verification Under Third Plan

All direct charges to the accounts for the different classes of product being provided for as described, the indirect expenses still remain in an account by themselves. One feasible way of applying them to the different classes of

product is by making a distribution on the basis of labor cost. The total indirect expenses are divided by the total labor cost for all the product, and the rate or per cent obtained. The labor cost charged to each classification of product may then be multiplied by this rate and the pro rata share of the indirect expenses determined. The amounts distributed are charged to the various products through the journal, and the total is credited to the indirect expense account, which then balances.

The totals of all the charges then represent the estimated inventory value at the beginning of the period, plus the actual expenditures for the period. The accounts are now credited with the goods sold at the estimated cost prices, and classified in the same way. This information is taken, of course, from the analysis of cost of sales. The balance represents the book inventory, and—if the estimates are correct—will agree with the ending inventory when this is taken.

Wrong estimates as to labor or material can be located according to department and class of product. It is also possible to see, to a certain extent, how errors in calculating indirect expenses have affected the costs.

The methods of discovering sources of error and of revising estimates, and the verification of figures in the ledger, are the same as in the other plans of estimating costs, and need not be repeated here.

Profit and Loss Statement (Form 68)

The results of the third plan may readily be exhibited on a monthly statement of profit and loss, which is prepared from the ledger accounts entirely on the basis of the estimated costs, and without reference to the ending inventory.

The amount and cost of sales are entered in their columns according to the class of product, and the difference extended

into the next column headed "Gross Profit." The total selling expenses are then distributed over the several classes of products on an arbitrary percentage basis. The administrative expenses are distributed in the same manner, and the totals of the selling and administrative expenses for each column should be extended to the "Total Expense" column.

The difference between the gross profit and the total expenses is then entered in the "Net Profit" column for each class of product, and represents the estimated net profit or loss on that class of product. The total of the column will, of course, represent the total estimated net profits or losses of the business.

When the actual ending inventory is taken, the adjustments may be made in the ledger by debiting or crediting the Sales account in the same manner as before explained, and the statement may then be prepared on the basis of actual costs.

CHAPTER XIII

DEPARTMENTAL SYSTEMS

Departmental and Estimating Cost Systems

The departmental cost system is the next step in advance upon the estimating system last described. In both systems the class of product is the unit on which costs are based, the difference being that in the estimating system the costs are estimated and verified at the inventory periods, while in the departmental system they are not estimated, but are determined either at inventory periods or by compiling the costs monthly. It must be kept in mind that the word "Department" in this system does not refer to factory departments, but to departments or divisions of finished stock, as men's shoes, women's shoes, children's shoes, etc. To avoid confusion, the term "Operating Department" will be used when reference is made to the divisions in the processes of manufacture.

Scope of the Departmental System

A departmental system is not supposed to do the work of a complete system; but manufacturers often object to the extra work and clerical help necessary to operate a complete system, and for that reason provision has been made for the more elementary methods of finding costs exemplified by the departmental system. As a rule the results are satisfactory; and where they are not, the elementary methods of the system are sufficient to show the cause, and often indicate along what lines a complete system should

be conducted. It is not to be expected that a departmental system will perform all the organization and efficiency functions that are provided for in complete system work.

Conditions Where Applicable

It should be clearly understood that a system of this character is only applicable to those plants where the production order may be made to cover a distinct class of product which is to be identified with the selling classification in finished product. This principle must apply to every operating department of the plant. In some factories one or more operating departments manufacture product which cannot be identified clearly with the selling classifications until it has reached the final stages, or can be identified only in the finishing and assembling departments. In such cases a departmental system will not be practical unless it is supplemented by a different system used in the beginning processes of manufacture, and based on the unit of production. Even then it would be preferable to use one of the complete systems, as under such conditions the departmental plan loses the simplicity which is the chief point in its favor.

Methods and Principles

The principles and methods of the departmental system may be outlined as follows:

(1) The costs are to be found on the different classes of product as units. No distinction is made between different articles or kinds of articles belonging to the same class and only incidental attention is given to operating department costs.

(2) The unit of time chosen is the inventory period. The accuracy of the calculated costs is checked up and adjusted by means of the beginning and ending inventories.

(3) All material taken from the storeroom is recorded

and classified according to its use in the various classes of product.

(4) The cost of direct labor is classified in the same way, and the distinction between direct and indirect labor is definitely fixed.

(5) The total indirect expenses are computed from the various accounts, and are distributed over the departments of product as units. The only basis of distribution provided for in the system is the direct labor cost. If any other basis is required to meet a particular condition, the system should be amplified, and special arrangements made for collecting the necessary data.

(6) The sales made during the period are classified according to the classes of product, so that the gross profit or loss for each department may be determined.

(7) The selling and administrative expenses are prorated over the different departments on some arbitrary basis, and the net profits or losses for each determined accordingly.

(8) The proper accounts must be opened in the ledger to classify and summarize the data according to the foregoing plan of operation.

Forms Used

Six forms are ordinarily used in the departmental system, viz.:

(1) Purchase Journal
(2) Factory Order
(3) Bill of Material
(4) Time Report
(5) Analysis of Pay-Roll
(6) Register of Sales

While the forms described in this system are limited to the number specified above, it does not mean that organiza-

tion and efficiency forms described in other systems may not be used in a departmental system. Only the forms actually necessary are described here.

Purchase Journal (Form 6)

A simple form of purchase journal is used to good advantage in a departmental system. At the end of each month the party from whom goods and supplies are purchased is credited, and the totals of the raw material and other classifications named at the top of the purchase journal columns are debited. An account with raw material is kept in the ledger, and the material used is requisitioned out through a bill of material, according to classification of product.

All indirect expenses which are general in character are entered in the purchase journal under the captions "Supplies," "Repairs and Maintenance," "Insurance, Taxes and Rent," "Factory Expenses," etc., but wherever it is possible to charge factory indirect expenses of any kind against a classification of product, these items should be entered under "Sundry Accounts" according to the department affected, and should be posted directly to those department accounts.

Factory Order (Form 13)

The "Factory" or "Production" order is simple in design, and shows no costs on its face. It is the key, however, to the analysis of costs on the bill of material and time reports. A single order may be issued for different articles belonging to the same class, but the same order should never include articles of different classes. The order number and bill of material number specified on the order serve to identify the class; and all costs arising in connection with a particular order are at once identified by the classification number.

Bill of Material (Form 23)

A bill of material should be made out for every article manufactured. A material requisition will only be necessary for special orders outside the usual routine. The prices should be revised or new bills made out whenever there is a change in the cost of materials issued. The bill of material may be so devised that it will also serve as a receipt for material actually delivered under that bill, and the summary may be shown at the bottom of the sheet.

The total amount of each bill of material is credited to the Raw Material account, which has previously been charged with the beginning inventory, and with all material purchases made since.

Time Report (Form 26)

A "Time Report" or piece-work report that will apply to the conditions should be used. This report should show the classification of the product, the nature of the work, the time consumed, and, if practicable, the number of articles produced. The rate and amount columns are filled in and transferred to the "Analysis of Pay-Roll," the classification being made by means of the classification number.

Analysis of Pay-Roll (Form 35)

The "Analysis of Pay-Roll" may be used as the regular pay-roll if desired. The time or piece-work reports furnish the information, which is entered for each day of the week, and totaled for each pay-day. The distribution is made over the various classifications by means of the classification number.

In making the distribution by classes of product, it should be noted that certain forms of labor commonly

reckoned as indirect, can often be identified with certain classes of the product. To illustrate, a foreman or inspector may spend all his time in an operating department where there are only one or two classes of product operated on. While his work cannot be identified with any particular articles, it belongs strictly to the class or classes as a whole; and it would be a mistake to put such labor with the other indirect expenses and distribute it over all the departments. Labor costs that can be so identified decrease the amount of indirect expenses and increase the accuracy of the costs correspondingly.

When the pay-roll check is drawn, it should be charged in total to the Pay-Roll account in the ledger. When the amounts distributed on the analysis of pay-roll are charged against the respective department accounts and indirect labor, the Pay-Roll account in the ledger is credited.

Register of Sales

Where the sales are posted direct from the invoice, a form or book should be used for analyzing them into classifications of product.

Another method is illustrated by Form 64, where the sales are entered on a register, and columns are added for the classifications; but in this case the sales classifications only are provided for, the cost of sales being omitted.

At the end of the month, after all postings charging customers' accounts have been made, the total of the sales is charged to an Accounts Receivable account; and the department columns are credited to the Department Sales account in the ledger.

Department Accounts

When the system is first put in operation, department accounts are opened in the ledger according to the classi-

fications of product. When the inventory is taken, it should be classified by departments so far as goods in process and finished stock are concerned, and should be debited to the respective department accounts in the ledger.

The department accounts are also charged with all material taken into process of manufacture, the information being taken from the bill of material.

The labor cost chargeable to each department is taken from the analysis of pay-roll. At the end of the inventory period the total charges of the indirect expense account are distributed over the various departments on the basis of direct labor charged to each. As stated in the beginning, other methods of distribution can be used if provision is made for gathering the proper data, as for instance, the number of hours devoted by all the men to articles in each class of product, which might be taken from the time reports and be compiled on a special record. When the distribution is made, the indirect expense accounts are credited with the total amount.

At the end of the fiscal period the inventory is taken in the same manner as the beginning inventory and credited to the department accounts.

The balance of these accounts will represent the cost of the goods that have been shipped; and this balance should be transferred to the debit of the Department Sales account, this account then showing the gross profit or loss.

The selling and administrative expenses are then prorated and charged to the Department Sales accounts, the balance of these accounts showing the actual net profit or loss.

Work in Process Method

Another form of departmental system is based on the keeping of a "Work in Process" account in the ledger.

Where this account is kept the inventory at the beginning of the period is classified according to raw material, work in process and finished stock, and these three accounts in the ledger charged according to the inventory classification. The charges to the "Work in Process" account are taken from (1) the bill of material for raw material put in process, (2) the analysis of pay-roll for labor, and (3) the total of the indirect expense accounts.

At the end of each month the "Work in Process" account is credited with the material, labor and indirect expense, from the "Production Report of Finished Goods," which should be devised to show material, labor and indirect costs. At the same time the Finished Stock account is charged. The balance of the "Work in Process" account will then show the value of the work in process.

As sales are made they are credited to the Finished Stock account at cost, and charged to the department sales accounts in the ledger, these accounts being credited with the sales according to the proper classification. The balances of these accounts show the gross profit or loss.

When the actual inventory is taken, it should agree with the three classifications of inventory accounts in the ledger, viz.:

Raw material
Work in process
Finished stock

If any discrepancies exist between the theoretical and actual inventory, the difference will have to be distributed on some basis, to the debit or the credit of the department accounts, as the case may be.

Under this plan a monthly profit and loss statement may be taken from the books, the accuracy of which will depend on the accuracy of the factory reports.

CHAPTER XIV

SPECIAL ORDER SYSTEM BASED ON THE PRODUCTIVE LABOR METHOD

Introduction

In Chapter XII methods were presented by which the manufacturers' estimates of the various elements of costs were incorporated in the accounting system for the purpose of showing or proving the accuracy or inaccuracy of these estimates. This method, however, only tests the correctness of the estimates under general divisions, there being no individual proof on the article cost.

In Chapter XIII a step in advance was shown by the departmental system, in that it ascertained the actual costs by classes of product identified with selling classifications. In this, however, as in the estimating system, no provision was made for ascertaining the article cost.

This chapter presents a system by which the article cost may be obtained with a fair degree of accuracy. At the same time it meets the requirements of many manufacturers who wish to dispense with much of the detail in cost keeping. It is probably one of the simplest cost systems which can be used, and under suitable conditions will be found fairly satisfactory. It is not as complete as the systems which follow in respect to ascertaining actual cost; and, while the cost is found on the order or article so far as material and direct labor is concerned, the distribution of the indirect is made on a percentage based on the entire indirect expenses

of the plant, no provision being made for distribution on the basis of departments.

Purchase Requisition (Form 1)

In manufacturing industries where there are maximum and minimum limits to the amount of stock to be carried irrespective of customers' orders, the purchase requisition may be used by the stock clerk in notifying the purchasing department to order the required amount of goods, unless the stock system is in charge of the purchasing department, when no requisition is required. When the purchasing is guided by the orders received from customers, the purchase requisition may be made out by the clerk in charge of the orders, or by the foreman of a department, or by the superintendent upon receipt of the production order. It may cover only the material required on the particular production order, or it may include estimates of material required for a number of orders. Usually but one copy of the purchase requisition is made, and this is sent to the purchasing department, where it is filed. Conditions, however, may be such that it is advantageous to give duplicate copies to the foreman or superintendent, and in certain cases to the stock clerk as well.

The requisition usually bears a number, and is designed to show the date, the reason for ordering the article, the quantity, description, and the date the goods are wanted. It is signed by the person ordering the goods, and is approved by some one in authority. The date of the order and the purchase order number are filled in by the purchasing department.

Purchase Order (Form 2)

The information appearing on the purchase order will vary with the different conditions of selling. The form is

made out in duplicate, the original being sent to the person from whom the goods are ordered, while the duplicate remains in the office.

The particular feature of the form, as it relates to this system, is the caption "Charge To." This will apply to three different classifications:

(1) Charges to the cost of material purchased for a factory order

(2) Charges to the cost of material purchased for a customer's order

(3) Charges to the raw stock record

In case goods are to be charged under either of the first two classifications, no material requisition is required. In case they are ordered for stock, it should be so stated under the caption "Charge To," and a material requisition is necessary to take these goods out of stock and put them in process.

When goods are charged to either a customer's order or a factory order, the supposition is that they will be used when received; and in such case it is unnecessary to make any record on the raw material stock record. If, however, they go into stock when received, they should be entered on the raw stock record.

Report of Material Received (Form 3)

The original and duplicate copies of this form, after being filled out as to quantity by the receiving clerk, should be sent to the general office. The original goes to the purchasing department and the duplicate to the clerk in charge of the stock or cost records for comparison with the invoice and for entry of the material on the raw stock records or cost sheet, according to whether the material is

taken into stock or is immediately used for some particular customer's order. After the invoice has been checked, it is approved and entered upon the Purchase Journal.

Purchase Journal (Form 6)

The Purchase Journal is a columnar book which serves:

(1) As an analysis for all invoices
(2) As a posting medium to the creditors' accounts affected

The invoices are entered according to date. Each item of the "Total Amount" column is posted to the credit of the particular creditor's account, and the total of the column is credited to the Accounts Payable account in the general ledger, which represents a controlling account for all the accounts in the creditors' ledger, showing in total what the creditors' ledger shows in detail. The totals of the other columns, with the exception of the last two, are posted to the debit of their respective accounts. The amounts in the last column are posted in detail to the debit of the specific accounts mentioned under the caption "Sundry Accounts." All the amounts entered in the "Raw Material" column should have been charged in the raw material stock record or the cost sheet, under the caption "Material," from the report of material received.

Stock Record—Raw Material (Form 10)

The entry in the raw material stock record under the caption "Ordered" should be made when the stock clerk makes out the purchase requisition. The information under the caption "Received" should be taken from the material received sheets, and the information under the caption "Delivered" from the report of material delivered. The

costing of the material is made from the report of material received.

Production Order and Cost Sheet (Form 15 a)

This form provides for charging all costs to a particular order number, shows the date wanted and to be completed, and is made out in duplicate. The original, which is purely the production order, is sent to the factory, while the duplicate remains in the office, where the charges for material, labor and overhead are entered upon it. The features of gathering the elements of the cost upon the duplicate copy are explained under the later discussions of cost sheet calculations.*

Material Requisition (Form 19)

This form is made out by the foreman of the operating department when he requires material called for by a production order. The particular style of the form will depend on the class of material used. Where one material requisition embraces all the material on an order, it will not be necessary to use a summary of material delivered; but where the material is taken out on two or more requisitions, the summary of material delivered should be used, and the "Cost" column of the material requisition need not be filled out, the costing in this case being done on the summary of material delivered.

Report of Material Delivered (Form 25)

The "Report of Material Delivered" summarizes the material cost by classification of material and by order number. This is done for the purpose of crediting the raw stock records and charging the cost sheet with the material as it is used on orders.

*"Production Order and Cost Sheet (b)," page 192.

Employees' Time Report (Form 30)

The main point to bear in mind when designing a time report is to harmonize it with the principles of cost-finding, as applied in the particular system. The form presented herewith is intended to be used with a time stamp, but it is not intended to imply that a form of this character must necessarily be used with the system of cost-finding under consideration. In using the form illustrated, the time should be stamped on the card, the order number entered, and the operation upon which the workman is engaged checked, all operations being printed on the form.

The cost of all the productive labor as shown by the employees' time reports should be entered on the production order and cost sheets of each order, and also on the pay-roll.

Labor of any other kind, which cannot be charged to a production order, forms part of the indirect expenses and should be entered on the pay-roll form under the caption "Indirect." Should the labor be in the nature of an asset, such as labor on the construction of a machine to be used for manufacturing purposes in the plant, the time should be charged to a special production order.

Pay-Roll (Form 39)

When a pay-roll of the design shown is used, the time records should be summarized and entered on the pay-roll at the end of each week, the entries showing the amount due to the workmen, and the distribution into direct and indirect. "Supervision" is made a separate classification here, although it is also "indirect." The charges in the column headed "Supervision" are usually for services of the foreman in the operating department, but may also include any other labor charge of this character.

When wages are paid, the amount of pay-roll is entered

in the cash book, according to the classification shown in the pay-roll, these classifications being debited in the ledger.

Production Order and Cost Sheet (Form 15b)

The arrangement of that portion of the production order used for collecting the cost data will depend entirely on the class of business in which the special order system is used. The design shown here is made in duplicate, the original or short copy going to the factory, and the duplicate remaining in the office.

The information under the caption "Material" will come from the report of material received, the material requisition, or the report of material delivered. This will give the material cost of the order. The labor cost is obtained from the time reports, and may be posted directly from these records, according to operation, or may be summarized on a pay-roll analysis and posted in total.

The "Indirect" will be ascertained by adding to the labor cost a fixed percentage to cover indirect expenses. The percentage used in this system is predetermined, based upon the results of past periods, and may be changed at inventory periods, or as conditions warrant.

Stock Record—Finished Product (Form 56)

When all orders are shipped immediately upon completion, it is unnecessary to keep a finished stock record; but where a stock of the finished product is carried on hand the entries under "Production" should be made from the production order and cost sheet, and under "Sold" from the sales record.

It frequently occurs in a special order business that parts which are common to certain styles of product are manufactured and kept in stock, so as to facilitate shipments when orders are received. In all such cases the regular

production order and cost sheet should be used, and the regular course pursued.

Bill and Shipping Order (Form 62)

The billing system provides for three copies of the bill and shipping order, which are used as follows:

Original—Serves as a bill which is sent to the customer.

Duplicate—Serves as a shipping order.

Triplicate—Serves as a sales record, being used for posting to the customer's account. It also provides columns for calculating the cost of the sale.

Credit Certificate (Form 63)

This form is used for returns of goods sold, the selling price being taken from the sales record or the sales sheet, and the cost price from the "Production Order and Cost Sheet." The original is sent to the customer, and the duplicate remains in the office to act as a posting medium to the accounts. A material received sheet should be made out in all cases where merchandise is returned, showing the actual receipt of all such goods and thereby serving as a voucher for the credit certificate. The merchandise returned should be entered on the finished stock records. In case returned goods are defective, they may be entered on the part-finished stock record until the defects are corrected or until the goods are disposed of as seconds or scrap. The loss in value or the cost of repairs will be charged against the department or account affected.

Register of Sales and Costs (Form 64)

This form provides for registering the sales and distributing the sales price and cost according to sales

classifications. Goods returned as shown by the credit certificates should also be entered on a separate sheet of the register of sales and costs and, at the end of the month, deducted from the totals according to their respective classifications.

The total of the "Accounts Receivable" column should be charged to that account in the general ledger, and the total of the sales columns "A," "B," and "C" should be credited to these accounts in the ledger.

The total of the "Cost of Sales" column should be credited to the finished stock account, and the totals of the cost of sales columns "A," "B," and "C" should be charged to the sales accounts in the ledger.

Inventory Test (Form 60)

The purpose of the "Inventory Test" is explained in Chapter VII, but a brief reference to it is necessary here, as no system should be operated without a form of this character. Should the inventory test reveal missing stock which cannot be accounted for, an entry should be made crediting the stock records, and charging an account—which might be called "Over, Short, and Damaged Account"—in the ledger. Should the stock records show less stock on hand than is actually found, then the entry would be a debit to the stock records, and a credit to the Over, Short, and Damaged account. The balance of this account forms part of the general operating expenses.

Explanation of Chart and Summary of Entries

Subsidiary Forms and Records

The books and forms used to authorize and record the purchase of materials and supplies, and other expenditures as these are made, are four in number:

(1) The "Purchase Requisition," which shows the materials and supplies required, and is followed by

(2) The "Purchase Order," which is sent to the creditor, ordering the necessary materials or supplies.

(3) The "Invoice," which is checked when received with the purchase order, and also with the report of material received, and is then entered upon

(4) The "Purchase Journal," which classifies the expenditures, for posting to the controlling accounts affected.

The forms required in recording, receiving, storing and requisitioning raw material are as follows:

(1) "Report of Material Received," which—after being verified with the purchase order—is entered on

(2) The "Raw Stock Record"—unless the material is entered directly upon the cost sheet of a particular order.

(3) The "Material Requisition," which shows the raw materials required for a certain order, and may be entered directly upon the cost sheet of a particular order, when same is credited to the raw stock record, or may be recapitulated upon the report of material delivered.

The report of material delivered shows the raw material put into operation, which is credited on the raw stock records, and charged to the cost sheets of the various orders affected.

The forms necessary for the compilation of the cost data are as follows:

(1) The "Cost Sheet," which is charged with the material put into operation from the "Report of Material Delivered," as above described, with the labor cost from

(2) The "Time Reports," and with the indirect expenses which are obtained from a previously prepared

(3) "Schedule Showing the Fixed Percentage" to be added to the labor cost.

The time reports are summarized upon the pay-roll for pay-roll purposes.

When orders are completed they are either transferred to the "Finished Stock Record," or shipped and billed directly. In case the finished orders are put into stock, entry is made upon the finished stock record. When the orders are shipped and the bill is prepared, entry is made in the "Register of Sales and Costs." In case the credit certificate shows merchandise returned, entry should be made upon the finished stock record, and also upon the register of sales and costs.

Method of Control

The controlling accounts in this system are all kept in the general ledger, and are as follows:

(1) Raw Material
(2) Direct Labor
(3) Accounts with the items composing the indirect expenses
(4) Overhead
(5) Work in Process
(6) Finished Stock
(7) Accounts with the various sales classifications

(1) The Raw Material account represents in total what is shown by the raw stock records in detail. It is debited with the total purchases of raw material, as shown by the purchase journal, and is credited with any allowances, and with the total raw material which has been requisitioned out, as shown by the report of material delivered, the balance representing the inventory of raw material and agreeing with the detailed raw stock records.

(2) The Direct Labor account is debited from the cash book with the total amount paid for productive labor, and is credited from the summary of the time reports with the total amount distributed and charged to the "Production Order and Cost Sheets."

(3) The accounts representing the items composing the indirect are debited, either from the purchase journal or cash book, with the amount incurred for each classification, and are credited each month with the balance of the account, unless part of same is to be treated as a deferred charge.

(4) The Overhead account is charged each month, through a journal entry, with the items composing the indirect expenses, and is credited from the schedule showing the fixed overhead percentage with the total amount applied to the various production orders and cost sheets. The balance, if a debit, shows the undistributed portion of the overhead, which means that the fixed percentage added to the labor cost was not sufficient to cover the indirect expenses. When there is a credit balance, however, it shows that the percentage allowed was more than sufficient. In either event, the percentage to be used for the next period should be adjusted in accordance with the information thus disclosed.

(5) The Work in Process account is debited with the total amounts that have been credited to the raw material, direct labor and overhead accounts, and is credited from the

summary of finished orders with the total cost of the orders that have been completed, when these are either transferred to finished stock or shipped. The balance represents the total amount of work in process, and should agree with the total production orders and cost sheets not completed.

(6) Finished Stock account is debited from the summary of finished orders with the total cost of completed orders, and is credited from the register of sales and costs with the total cost of the sales, the balance being the inventory of finished stock. It represents in total what is shown in detail by the finished stock records.

(7) Sales accounts should be kept with each classification of the product, and should be debited with the total cost of the sales when same is credited to the Finished Stock account. The accounts are credited with the total selling price of the sales when same is debited to the Accounts Receivable account. The balance, if a debit, represents the gross loss, and, if a credit, the gross profit.

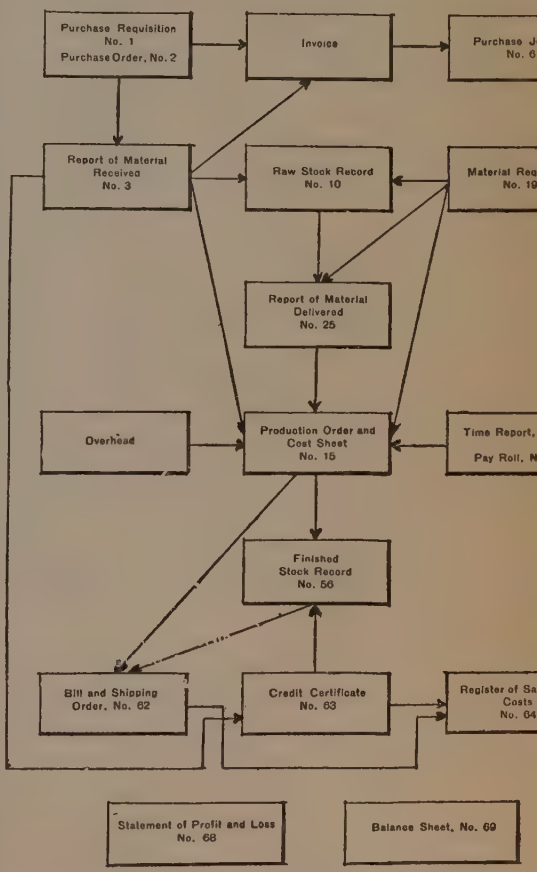
Profit and Loss Statement (Form 68)

The "Profit and Loss Statement" is prepared from the ledger accounts. The departments represent the classifications of the product according to selling departments. The information for the first three columns is obtained from the sales account of each selling department. The selling and administrative expenses may be distributed over the various departments on some arbitrary basis, according to the amount of sales, cost of sales, or gross profit that each department bears to the total of all departments. If, however, some of the items composing the selling and administrative expenses can be localized and charged to a specific department, this should be done. In such case the results will be more accurate, because the total to be distributed arbitrarily has been lessened.

CHART OF

SPECIAL ORDER SYSTEM—PRODU

GENERAL DESCRIPTION OF ENTRIES	DETAILED RECORDS AND FINAL STATEMENTS
Authorization and Purchase of Material and Supplies and Incurring Other Expenditures	
Receiving, Storing and Requisitioning Raw Material	
Raw Material put into Operation.	
Compilation of Cost Data on the Cost Sheet.	
Transfer of Finished Orders to the Finished Stock Records.	
Shipment or Return of Finished Stock and Entry upon Register of Sales and Costs.	
Final Statements.	


Purchase Requisition No. 1 Purchase Order, No. 2
Invoice
Purchase J No. 6
Report of Material Received No. 3
Raw Stock Record No. 10
Material Req No. 19
Report of Material Delivered No. 25
Overhead
Production Order and Cost Sheet No. 15
Time Report, Pay Roll, N
Finished Stock Record No. 56
Bill and Shipping Order, No. 62
Credit Certificate No. 63
Register of Sa Costs No. 64
Statement of Profit and Loss No. 68
Balance Sheet, No. 69

JCTIVE LABOR METHOD

METHOD OF CONTROL AND ENTRIES AFFECTING GENERAL LEDGER	
POSTING MEDIUM	GENERAL LEDGER ACCOUNTS AFFECTED
Purchase Journal. Cash Book.	Dr. Raw Material Account Dr. Indirect Expense Accounts in detail Cr. Accounts Payable Dr. Direct Labor Account Dr. Indirect Labor Account Cr. Cash Account
Reports of Material Received, Material Requisitions or Report of Material Delivered. (Entered in Journal.) Journal Entry transferring Indirect Expenses. Summary of Time Reports and Overhead Percentage. (Entered in Journal.)	Dr. Work in Process Account Cr. Raw Material Account Dr. Overhead Account Cr. Indirect Expense Accounts Dr. Work in Process Account Cr. Direct Labor Account Cr. Overhead Account
Summary of Production Orders and Cost Sheets of Finished Stock. (Entered in Journal.)	Dr. Finished Stock Account Cr. Work in Process Account
Register of Sales and Costs	Dr. Sales Accounts Cr. Finished Stock Account Cr. Work in Process Account
Statement of Profit and Loss and Balance Sheet prepared from accounts in General Ledger.	

Balance Sheet (Form 69)

The balance sheet is also prepared from the accounts in the general ledger. In addition to showing the financial condition at the end of the month, it shows the increases or decreases of each item as compared with the previous period.

CHAPTER XV

SPECIAL ORDER SYSTEM BASED ON THE PROCESS OR MACHINE METHOD

The system outlined in this chapter provides for finding costs under the machine or process method, and differs from the system described in the preceding chapter more particularly in the method used for the distribution of indirect or overhead charges by operating departments or manufacturing centers. It is applicable where the production order represents the customer's order, although it may be used to advantage where the production order represents a definite production by classification of product from which customers' orders are filled. As the conditions in every plant—even those in the same line of business—are different in some respects, the forms submitted here are only for illustrative purposes, and to suggest the general nature of the designs to be used. It will be noted that certain forms are used of exactly the same kind as in the previous system.

Purchase Requisition (Form 1)

The explanation in Chapter XIV covers the salient points in connection with this form. As the present system is adapted to plants of larger size than the system described in Chapter XIV, the purchase requisition would usually be made out by the stock clerk, all material purchases going into the storeroom.

Purchase Order (Form 2)

In illustrating this design, which is the same as the purchase order of Chapter XIV, particular attention is called to the caption "Charge To," under which the entries should indicate whether the charge is to be made against the production order or the storeroom.

Report of Material Received (Form 3)

The explanation of this form will be found in Chapter XIV.*

Accounts Payable Voucher (Form 7)

The accounts payable voucher provides for recording and analyzing the expenditures, and arranging them in such a manner as to facilitate entry on the register of accounts payable. The expenditures are classified into two main divisions:

(1) Those affecting factory records
(2) Those affecting general ledger accounts

The entries affecting factory records consist of material, labor and indirect expenses; while the general ledger entries consist of administrative expenses, selling expenses, and all charges to capital accounts, such as real estate, plant, equipment, etc.

When the accounts payable voucher calls for materials or supplies purchased, the purchase requisition, purchase order and material received sheet should be attached; and if it shows the expenditure for labor as well, the pay-roll analysis should also be attached.

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*See page 188.

Register of Accounts Payable (Form 9)

The accounts payable vouchers are entered in the register of accounts payable according to date and voucher number. In addition to showing name of creditor and amount payable, the form provides space for entering payment of the voucher and for indicating the charges to the operating and property accounts.

The entries for the accounts in the general ledger are as follows:

The total of the "Accounts Payable" column is credited to the Accounts Payable account. The totals of the "Factory," "Selling Expenses," "Administrative Expenses," "Machinery and Tools," "Real Estate and Buildings," and "Furniture and Fixtures" columns are debited to their respective accounts. The details in the "Miscellaneous Accounts" column are posted individually to the debit of the proper accounts.

Stock Record—Raw Material (Form 10)

In this system, all raw material stock is supposed to be ordered by the stock clerk, who fills in the quantity under the proper caption at the time he makes out the purchase requisition. The information as to the quantities received and delivered is obtained from the report of material received and report of material delivered, the costing being obtained from the latter.

Production Order and Cost Sheet (Form 16)

It will be noted that in both the special order systems, the production order and cost compilation are combined. The two purposes—that is, the authorization for the manufacture of goods and the compilation of the costs—may as well be separated, and this has been done in the product

systems described elsewhere.* In the present system the first copy of Form 16 is used as a production order only, while the duplicate is used as a cost sheet. The purpose of using different designs in the different systems, as already explained, is to illustrate the different methods of gathering the cost data.

If sub-production orders are issued to the various departments, it will be necessary to use the original only, not the duplicate. The use of the duplicate copy is explained in its proper order in this system.†

Material Requisition (Form 19)

The general explanation of this form is given in Chapter XIV, but where the requisition is to be used for the supplies chargeable to a machine or process, the machine or process, according to the department, should be indicated under the caption "Charged" in place of "Order Number."

Report of Material Delivered (Form 25)

The "Report of Material Delivered" is used in this system to summarize the material requisitions according to department and order number. In case of supplies chargeable to a machine or process, the order number should be omitted, and the machine or process inserted. The costs of material delivered are entered on this form, and not on the requisition. The raw stock records are also credited from the "Report of Material Delivered." If the material is to be used for maintenance, an entry is made on the process card record, and if for repairs and supplies, on the "Power Cost and Distribution Record." The material cost is entered on the duplicate copy of the "Production Order and Cost Record," according to order number.

*Chapters XVI, XVII.
†Page 208.

Employees' Time Report (Form 30)

The time reports should be summarized for entry on the pay-roll in the same manner as in the previous system. All the direct labor is also entered upon the process card record, classified according to department, machine number, and operation. The direct labor time, classified by operations, is also entered upon the "Production Order and Cost Sheet" of the respective orders. It will be seen, therefore, that the direct labor time as entered upon the process card records should agree with the productive labor time entered upon the production order and cost sheet. The wages of the engineers and firemen should be entered upon the power costs and distribution record.

Pay-Roll (Form 39)

This design is the same as that used in Chapter XIV, but is used in the present system for pay-roll purposes only. Except for this difference, the explanation of the form given in Chapter XIV will apply here.

Analysis of Factory Expenditures (Form 41)

The "Analysis of Factory Expenditures" is used for analyzing the indirect expenses. The information is obtained from the accounts payable vouchers. The columns may be headed with the names of the items composing the indirect expenses; and at the end of a year a summary sheet may be prepared with the names of these items entered at the left of the form, and the months of the year running across the top of the form. This summary sheet should prove valuable as a comparative statement, showing the variations in the indirect expenses each month.

That portion of the indirect expenses chargeable directly to a particular department should be entered on the

process card record of that department. The items of the indirect that are chargeable to the power costs should in a like manner be entered upon the "Power Costs and Distribution Record." The remaining items of indirect expense are distributed on the basis of productive labor.

Process Card Record (Form 45)

Wherever a process cost system can be used, it will give more accurate results than any other method employed in cost finding. It is by the process card record and power cost and distribution record that the principles of the system are illustrated. The process card record will, of course, permit of changes according to conditions in manufacture, not only as to arrangement of columns for the analysis of costs, but also as to arrangement of the information. The results to be obtained, however, are the operating hours, and the various machine or process costs.

To illustrate: The form shown provides for the distribution of time and cost on the side of the form, and the operations at the top of the various columns. By leaving the columns last mentioned blank, and using a separate card for each operation or machine, the columns may be headed according to days, weeks or months, without changing in any way the ruling shown, and without affecting the results to be accomplished. On the other hand, the form may be re-designed, the distribution of the time and cost be entered at the top of the columns, the operations entered on the side, and the form used as a daily, weekly or monthly record for all operations in the plant. Where this is done, and the form used for recording daily transactions, naturally a new sheet or card must be used each day, and summarized by the week or month.

The entry from the time records on this card will show the machine hours of operation and the idle machine time.

Under the captions "Day Work" and "Piece Work" will be entered the labor cost for each day. Under the caption "Supplies" will be entered the cost of supplies, as shown by the report of material delivered, and under the caption "Power" will be shown the power cost as taken from the "Record of Power Costs and Distribution."

The next item, "Floor Space," is the rent, or other charges which take the place of rent if the building is owned. These are obtained from the analysis of factory expenditures. The total floor space of the plant is to be ascertained by departments, and this total divided into the total cost of the floor space will give the cost per square foot. The space occupied by each machine or process should be calculated in square feet, and this number multiplied by the cost per square foot, will give the amount to be charged for floor space. A permanent schedule should be on hand stating the various divisions of floor space.

Where the property and plant are owned by an individual or company, the amount of rental will be ascertained by taking into consideration, interest, taxes, maintenance, insurance, and any other items relating to the cost of the ground or building. Under the caption "Maintenance" the cost is obtained from the time reports and from material requisitions or reports of material delivered. "Depreciation" should come from a permanent schedule, to be made up so that a fixed charge, based on the machine charge for actual working hours, may be made against each month's operation, and divided among the machines or processes.

The "Insurance" item is taken from a schedule compiled from the total amount of insurance paid, that part of the insurance applying to the machinery being divided departmentally among the various operating departments.

The information under the caption "Department Indirect" is obtained from the analysis of factory expenditures,

which shows the indirect expenses chargeable to different operating departments which are not already classified on the process cost card.

The last item, "Indirect Expenses," can be obtained from the analysis of factory expenditures by taking the balance of the indirect expenses for the cost period, and dividing this amount by the machine hours. The rate per hour thus ascertained, multiplied by the hours charged to each machine or operation, will give the amount chargeable to this machine or operation.

It will now be seen that all the costs relating to manufacturing, except material, have been charged against machines or operations. The total operating cost per hour will now be calculated for each machine or operation. The rate obtained is then applied to the various orders passing through any or all of the machines or operations, according to the time consumed, by multiplying the number of hours by the rate per hour, the result being the process or machine costs. The information contained on the process card record is transferred to the production order and cost record.

Power Cost and Distribution (Form 46)

This record, as to labor costs, is made up from the time reports. The rental, depreciation, and insurance items are entered from the prepared schedules already referred to. The record of repair costs will come from the time reports, and also from the material requisitions or reports of material delivered. Oil, waste, etc., will also come from the material requisitions or reports of material delivered.

The total of this power cost is divided by the total horse-power hours of all machines as actually operated, to obtain the rate per horse-power hour. This unit rate or horse-power cost per hour is multiplied by the total number

of operating hours of each machine, and the amount extended in the column headed "Power Costs." The total of this column should equal the total shown in the column headed "Costs" in the analysis of power cost.

Production Order and Cost Sheet (Form 16)

The original of this form has been referred to previously as a production order. The explanation which follows applies only to the duplicate copy. The information under the caption "Operations" is taken from the time reports of the employees, chargeable to the order. The entries are for time only, and a summary of the time records for this purpose should be made.

It does not make any difference how many employees are engaged on one operation, or what their rate may be, as the total number of hours for each operation or machine is all that is entered on this record from the time reports. At the end of the month the total time in each operating column is shown, and the process or machine rate entered, this latter information being obtained from the process card record.

The total number of hours, multiplied by the rate per hour of each operation, will give the process or machine costs chargeable to the order, according to operation or machine. The total of the various operations will give the total cost chargeable to the order, including indirect or overhead expenses.

The information under "Material Used" will be taken from the report of material delivered, and the total entered after the word "Material" under the caption "Summary." The total cost of the order is obtained by adding the process cost to the material cost.

Below the total cost may be entered the quantity of the order, the price per piece, where it is applicable, the selling

price and gross profit. The cost of the order is entered under the proper classification in the finished stock records, and the information under "Selling Price" should be used in billing the order for shipment. The cost and selling price may also be used in the analysis of cost of sales.

Other Forms Used

Stock Record, Finished Product (Form 56
Bill and Shipping Order (Form 62)
Credit Certificate (Form 63)
Register of Sales and Costs (Form 64)
Inventory Test (Form 60)
Statement of Profit and Loss (Form 68)
Balance Sheet (Form 69)

The general explanation of these forms in Chapter XIV is sufficient to show their use in the present system.

Explanation of Chart and Summary of Entries

Subsidiary Forms and Records

The forms necessary to record the authorization and purchase of materials and supplies, and to record the other expenditures incurred, are as follows:

(1) Purchase Requisition
(2) Purchase Order
(3) Invoice

All these are used in the same manner as described in the previous system.

The accounts payable voucher is used for the purpose of classifying the expenditures preparatory to their entry on the register of accounts payable. The information

necessary to classify the expenditures on the accounts payable voucher is obtained from the invoice in the case of materials and supplies or indirect expenses, and from the pay-roll in the case of direct and indirect labor.

The forms used in receiving, storing, and requisitioning raw material and supplies are used in the same manner as in the previous system.

The report of material delivered is used to show the raw material and supplies put into operation; and the information relating to raw material is transferred to the "Production Order and Cost Sheet," while the information relating to the supplies is transferred to either the process card records or the power cost and distribution records.

The compilation of the cost data is made upon the production order and cost sheet. The information for the material charged is obtained from the report of material delivered. The information for the labor and indirect expense charges is obtained from the process card record, together with the time reports, which show the productive labor time upon each particular order.

The productive labor cost is transferred to the process card records or the power cost and distribution records from the time reports, which are summarized upon the pay-roll for pay-roll purposes and entered upon the accounts payable voucher.

The information for the analysis of factory expenditures is obtained from the accounts payable voucher, and is transferred to either the power cost and distribution records or the process card records. Afterwards all information on the power cost and distribution records is transferred to the process card records.

The cost of the finished stock orders or finished parts is transferred to the respective stock records; and in case any finished parts are put back into operation for completion,

the cost of such parts is transferred to the cost sheet. When finished parts or finished stock are shipped, the stock records are credited, and an entry is made upon the register of sales and costs from the duplicate of the bill and shipping order.

When merchandise is returned by a customer, a report of material received is made out, which supplies the data for (1) the credit certificate, (2) transferring such merchandise back into either part-finished or finished stock, and (3) making the proper entry upon the register of sales and costs.

Method of Control

The cost records in this system are controlled by means of a "Factory" account, which is kept in the general ledger. This account is debited with all the factory charges of material, labor and indirect expenses when the Accounts Payable account is credited. The Factory account is credited with the cost of the sales when these are charged to the various sales accounts. The analysis of the Factory account is shown by accounts which are kept in the factory ledger, and its balance should agree with the total of the balances shown by the accounts in the factory ledger.

Factory Ledger Accounts

The following accounts are kept in the factory ledger:

(1) Raw Material and Supplies
(2) Direct Labor
(3) Indirect Expense
(4) Power Costs
(5) Process Costs
(6) Work in Process
(7) Part-Finished Stock
(8) Finished Stock

The Raw Material and Supplies account is a controlling account for the raw stock records, and shows in total what is shown by the raw stock records in detail. It is debited with all purchases of raw material and supplies from an analysis of the "Factory" column in the register of accounts payable. It is credited with any allowances, and with the total amount of material and supplies delivered to the operating departments.

The Direct Labor account is debited with the total amount of the productive labor from the analysis of the "Factory" column in the register of accounts payable, and is credited in total from the summaries showing the distribution of productive labor when this latter is charged either to the process costs or power cost accounts.

The Indirect Expense account is debited from an analysis of the "Factory" column in the register of accounts payable with the items composing the indirect when these are incurred, and is credited from the analysis of factory expenditures with the distribution of the indirect expenses when these are charged either to process costs or power costs.

The Power Costs account is debited with the supplies necessary for repair and maintenance of the machines, as per report of material delivered; with the amount of the labor as per the time reports summary, and with the indirect expenses chargeable to the various machines as per analysis of factory expenditures. It is credited from the "Power Costs and Distribution Summary" with the distribution of the total cost when this is charged to the process costs.

The Process Costs account is debited with direct labor from the time report summary, with the supplies chargeable to the various operations, as per report of material delivered, and with the indirect expenses chargeable to the various operations as per the analysis of factory expenditures. The

account is credited from the process card record summary with the distribution of the total cost when this is charged to the Work in Process account.

The Work in Process account is debited with the amount of material delivered to the operating departments and chargeable to the various orders as per report of material delivered, and is also debited with the distribution of the process costs as per the process card record summary. The account is credited with the total cost of the finished orders either of finished stock or part-finished stock, as per the summary of finished orders, when this is charged to the respective finished stock accounts. The balance of the Work in Process account represents the total amount of work in process, and should agree with the total of the cost sheets of the uncompleted orders.

The Part-Finished Stock account is debited from the summary of finished orders with the total amount of the cost of the finished parts, and is credited either from the "Summary of Production Order and Cost Sheet" with the total cost of these finished parts when they are put back into operation to be completed, or from the register of sales and costs with the total cost of the finished parts sold. The balance of the account represents the amount of the inventory of the part-finished stock, and should agree with the detailed stock records of the finished parts.

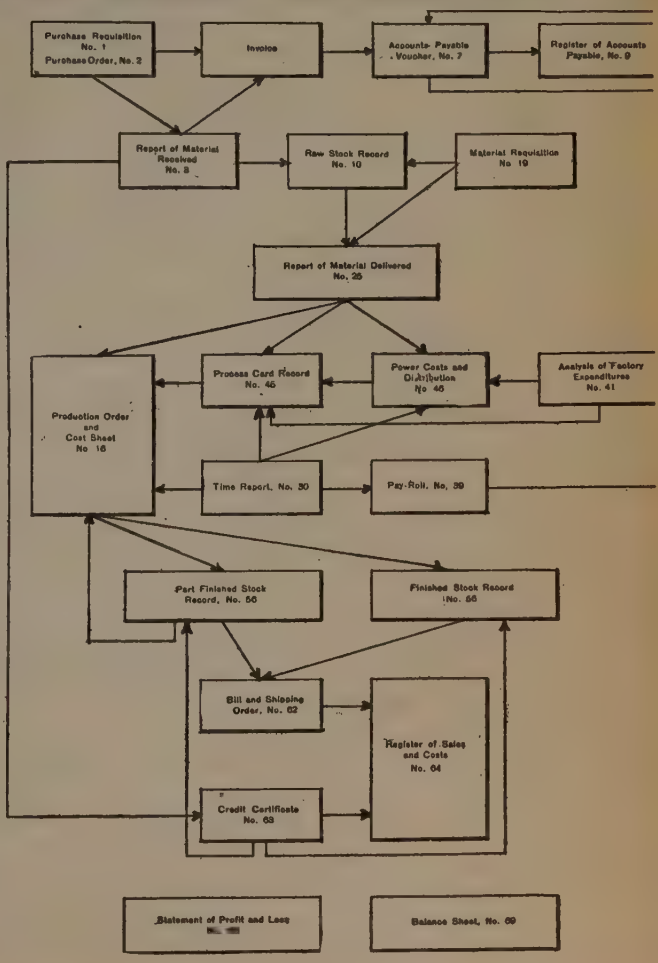
The Finished Stock account is debited from the summary of finished orders with the total cost of the finished orders, and is credited from the register of sales and costs with the total cost of sales. The Finished Stock account is the controlling account for the finished stock records, and shows in total what is shown in detail by the finished stock records, the balance of the account representing the amount of finished stock on hand.

It will now be seen that if the factory ledger accounts have been posted as described, and a list of the balances of these accounts is prepared, the total of these balances will be in agreement with the balance of the Factory account in the general ledger.

CHART OF

SPECIAL ORDER SYSTEM—PROCES

GENERAL DESCRIPTION OF ENTRIES	DETAILED RECORDS AND FINAL STATEMENTS
Authorization and Purchase of Material and Supplies and Incurring Other Expenditures	
Receiving, Storing and Requisitioning Raw Material and Supplies	
Raw Material and Supplies put into Operation	
Compilation of Cost Data on Cost Sheet. (1) Charging Raw Material and Supplies. (2) Charging Productive Labor Cost and Time. (3) Analyzing and Charging Indirect Expenses. (4) Compilation and Distribution of Power Costs. (5) Compilation and Distribution of Process Costs.	
Transfer of Finished Parts and Finished Orders to the Stock Records. Transfer of Finished Parts into Operation.	
Shipment and Sale of Finished Stock or Part Finished Stock. Return of Finished Stock or Part Finished Stock. Entries upon Register of Sales and Costs.	
Final Statement	


Purchase Requisition No. 1
Purchase Order, No. 2
Invoice
Accounts Payable Voucher, No. 7
Register of Accounts Payable, No. 9
Report of Material Received No. 8
Raw Stock Record No. 10
Material Requisition No. 19
Report of Material Delivered No. 25
Process Card Record No. 45
Power Costs and Distribution No. 46
Analysis of Factory Expenditures No. 41
Production Order and Cost Sheet No. 16
Time Report, No. 30
Pay-Roll, No. 39
Part Finished Stock Record, No. 56
Finished Stock Record No. 55
Bill and Shipping Order, No. 62
Register of Sales and Costs No. 64
Credit Certificate No. 63
Statement of Profit and Loss
Balance Sheet, No. 69

...S OR MACHINE METHOD

METHOD OF CONTROL OF COST RECORDS		
POSTING MEDIUM	FACTORY LEDGER ACCOUNTS AFFECTED	GENERAL LEDGER ACCOUNTS AFFECTED
Register of Accounts Payable and Accounts Payable Vouchers	Dr. Raw Material and Supplies Dr. Direct Labor Dr. Indirect Expense	Dr. Factory Account Cr. Accounts Payable
Report of Material Delivered	Dr. Work in Process Dr. Process Costs Dr. Power Costs Cr. Raw Material and Supplies	
Time Reports Summary	Dr. Process Costs Dr. Power Costs Cr. Direct Labor	
Analysis of Factory Expenditures	Dr. Process Costs Dr. Power Costs Cr. Indirect Expense	
Power Costs and Distribution Summary	Dr. Process Costs Cr. Power Costs	
Process Card Record Summary	Dr. Work in Process Cr. Process Costs	
Summary of Production Orders and Cost Sheets of Finished Orders or Finished Parts	Dr. Finished Stock Dr. Part Finished Stock Cr. Work in Process	
Summary of Production Orders and Cost Sheets of Finished Parts to be completed	Dr. Work in Process Cr. Part Finished Stock	
Register of Sales and Costs	Cr. Finished Stock Cr. Part Finished Stock	Dr. Sales Classifications Cr. Factory Account

Statement of Profit and Loss and Balance Sheet are prepared from the accounts in the General and Factory Ledgers.

CHAPTER XVI

PRODUCT SYSTEM BASED ON THE PRODUCTIVE LABOR METHOD

In the two special order systems the costs are collected on the production order. In this system the costs are collected on the production report.

The present system differs from the last two systems described in its methods of distributing indirect expense, and also in the fact that the complete costs are gathered departmentally and transferred progressively from one department to another. The costs in this system have no relation to customers' orders, as the goods are manufactured and carried in stock, and orders as they come in are filled from this stock.

Purchase Forms

The following purchase forms are used in the present system:

Purchase Requisition (Form 1)
Purchase Order (Form 2)

These forms are the same as shown in Chapters XIV and XV, and may be used in this system unchanged.

Report of Material Received (Form 4)

It will be noted that this form is quite different from that used in Chapters XIV and XV. In many cases, where

a product system is used, raw material and supplies will be ordered in large quantities, and in such instances the freight charges will be considerable. Provision is therefore made in this form for a complete distribution of freight and other charges bearing directly on the cost of material.

Under the caption "Article," the lot number, description, and quantity only are filled out by the receiving clerk, all other columns being entered in the office. When the entry is made from this form to the raw stock record, the cost will be the total cost of the article after the distribution of charges has been made.

From the information under the caption "Factory Ledger," the record on the accounts payable voucher will be made. The entry of material received is made on the raw stock records, and also on the accounts payable voucher in conjunction with the invoice.

Accounts Payable Forms

For the present system these forms are as follows:

Accounts Payable Voucher (Form 7)
Register of Accounts Payable (Form 9)

A general explanation of these forms will be found in Chapter XV.

Stock Record—Raw Material (Form 12)

This form is one of the most complete records used for raw material stock. As a mere record of raw material stock received and delivered, it would be unnecessary to have all the information called for by the form as shown; but in most cases such additional information is of distinct value to the management.

The special feature of this record is the provision made

to show amounts of goods ordered, the amount reserved for some particular purpose, and the amount of stock available for general manufacturing purposes.

The entries on this record are made from the purchase order, the material received report, and the report of material delivered. The information under the caption "Reserved" comes either from the purchase requisition, purchase order or some other special source.

Production Order (Form 13)

The "Production Order" in this system is intended only as an order to the factory to manufacture a certain amount of goods. A form of this kind should also be used for work of any description or character performed in the plant, such as repairs, improvements, building of new machinery, etc. Costs are charged to such production orders in the same way as to the regular production order.

Material Requisition (Form 18)

The form presented is intended only to register material taken from stock according to department, order number or product chargeable, article and quantity, and as the information on these records is transferred to a summary of material requisitions or reports of material delivered, it is unnecessary to price the articles on the requisition.

Report of Material Delivered (Form 25)

The material requisitions are summarized on this form according to department and order number or product chargeable, the product chargeable being entered from the material requisition as to classifications of product. The report is priced, this information being taken from the stock record of raw material received, and is entered on that record under the caption "Delivered."

Employees' Time Report (Form 32)

The form of time report selected for presentation here requires the time to be punched either by the workman or foreman, or by some one detailed for that purpose.

Across the left end of the card are printed the hours from 6 to 12 and from 1 to 7, and the minutes are printed beneath, with a leeway of ten minutes between each operation, to provide for recording the finishing time of the operation just completed, and the beginning time of the new operation. If necessary, the design may be so ruled as to reduce this leeway to a minimum of two minutes. Along the sides of the card are printed the operations of the particular plant. Where the operations are not numerous, all operations may be printed on all the cards; but where there are a large number it is wise to print departmental cards, each showing the operations peculiar to its department.

The body of the card calls for the order number, date, department, employee's number, article, quantity produced, piece rate, time rate, premium rate, and total time. There is also provision for waiting time. A form containing only the order number, department, and labor cost can be used in this system, if desired.

The information contained on these time reports is transferred to the pay-roll, and also summarized and posted to the cost sheet.

Pay-Roll (Form 39)

The pay-roll is used, as in the preceding systems, for ordinary pay-roll purposes, and also for the distribution of the labor into direct, indirect, and supervision. The total of the pay-roll is entered on the accounts payable voucher for distribution to the factory ledger according to department and account.

When the pay-roll entry is made from the voucher into the register of accounts payable, it is charged in the "Factory" column.

Defective Work Report (Form 51)

While the defective work report is presented only in connection with the present system, it should be used in every system, as defective work is common in every plant. In some plants the labor cost of the defective work is deducted from the pay of the employee, and in very rare instances the material wasted is also charged to him.

Under the system here discussed, the loss caused by defective work is a departmental charge against indirect expenses, the account in the factory ledger usually appearing under the caption "Defective Work." If any part of the material is to be used again, a value should be put upon it, and this amount deducted from the total defective work cost and charged to the stock records.

Factory Ledger (Form 67)

The factory ledger is used to classify all the details of factory operations.

A ledger sheet or page is used for each department, and a number of sheets are used for general operating expenses, according to the account number. In addition, sheets should be used for raw material, part-finished, and finished stock, these giving the controlling accounts for the three classifications of the stock records.

The entries under "Material" are made from the report of material delivered, according to department. The information under "Labor" and "Indirect" is taken from the accounts payable voucher, according to department. Under the caption "Total Charges" is shown the total of all expenditures charged to a particular department. Under the

caption "Credits" will be entered the total of each departmental cost, as shown by the report of production and costs.

The balance as shown by the factory ledger for any operating department will represent the value of the goods in process in that particular operating department.

Statement of Factory Expenditures (Form 43)

The purpose of this form is to show the operations of a factory for a month or cost period. It is especially suitable in a system where the productive labor method is used, for determining the percentage of indirect expense to be applied to the cost of each order or article.

It would be well in this system to keep an account in the factory ledger of the indirect expenses, according to department, charging the total indirect expenses and crediting the department account each month with the percentage used on the report of production and costs. These departmental indirect expense accounts will then show to what extent variations exist between the fixed or arbitrary percentage and the actual, and will thus be a means of correcting the fixed percentage to a fair degree of accuracy.

Summary of Production and Costs (Form 54)

The summary of production and costs is used in ascertaining the complete departmental costs of an order, including the indirect expense. Individual reports are used for each department, and the total costs of each department are transferred to the succeeding department until the final operations are completed, when the total costs are transferred to finished stock. The first department naturally would have no record under the caption "Previous Operations"; but it should be borne in mind that an article may be transferred to part-finished stock at the end of an operation; and when these part-finished articles are put back

into process for completion their total cost should be entered on the summary of production and costs under the caption "Previous Operations." The production reports may be made daily or weekly, depending on the nature of the product.

The information for the summary of production and costs is obtained as follows:

Under the caption "Material," from the report of material delivered, and under the caption "Labor," from the time reports. Under the caption "Indirect," a department rate is used for calculating the amount on the basis of labor cost, as shown in the "Labor" column.

In the production report proper, the article, order number, and quantity columns are filled in by the foreman of the operating department, all other columns by the cost clerk. The totals of the material, labor and indirect columns are posted to the credit of the proper department account in the factory ledger. When the final form passes from the last operating department, with all the accumulated costs recorded, the "Quantity" and "Total" columns are charged to the finished stock records under the proper classification.

The fundamental principle of the system, which is to show at all times the progress of any particular order and the cost of all orders in process, by departments, is well illustrated by the summary of production and cost. If one of these forms is used for comparative costs, according to department and classification, it will be found of considerable value to the management.

Stock—Finished Product (Form 59)

An ordinary stock form showing production, sales, and balance, could be used in this system instead of the form shown; but as other information is frequently required in

connection with finished stock, the design presented here will be found more useful.

The particular features of this form are the columns headed "Orders Received," "Orders Cancelled," and "Unfilled Orders." The information coming under the caption "Production" is taken from the final departmental production report just described. The information under the captions "Orders Received" and "Orders Cancelled" is obtained from the order department, and the information under the caption "Unfilled Orders" is calculated on the form. The information under the caption "Sales" is taken from the sales sheet, providing the cost of the sales is entered on the duplicate copy of that record; otherwise it is taken from the "Summary of Production and Costs," the sales being taken out of stock at cost price.

Other Forms Used

Part-Finished Stock (Form 56)
Inventory Test (Form 60)
Sales Sheet (Form 62)
Credit Certificate (Form 63)
Register of Sales and Costs (Form 64)
Statement of Profit and Loss (Form 68)
Balance Sheet (Form 69)

These forms are of the same general character as those described in previous chapters.

Explanation of Chart and Summary of Entries

Subsidiary Forms and Records

The forms necessary in collating the information relative to the authorization and purchase of material and supplies and the incurring of other expenditures, and also those

forms necessary to record the receiving, storing and requisitioning of raw material, are used in the same manner as in the two systems previously described. The particular distinction in recording the information upon the subsidiary records lies in the method of compiling the cost data, which is done departmentally.

The raw material and supplies delivered to operating departments are charged from the report of material delivered to the summary of production and costs of the various operating departments. In like manner the labor costs are transferred from the time reports; and the indirect expenses are distributed upon a fixed basis, and charged from a previously prepared statement of factory expenditures which shows the percentages to be used in the various operating departments.

There are only three operating departments used for illustrative purposes in this chart, but, of course, the same principle applies regardless of the number of operating departments, which will be determined by the conditions of manufacture in the particular plant. The defective work of any operating department should be reported on a defective work report, and transferred from the summary of production and costs to a report showing the defective work, and the disposition of the same. The total cost, as shown by the summary of production and costs of each department in turn, is transferred to the succeeding department as operations progress until the work is completed or is transferred as part-finished stock.

In case of the manufacture of finished parts, transfers may be made from either one of the first two operating departments to the part-finished stock record. When these parts are put back into operation to be completed, they are transferred from part-finished stock to the proper department. When the article has passed through the final

operating department, which, in the case illustrated, is Department 3, its total cost is transferred, by means of the summary of production and costs, to the finished stock records, according to classification.

The subsidiary forms used to record information as to the sale and shipment or return of part-finished stock and finished stock, have been sufficiently described in the previous systems.

Method of Control

The method of control in this system differs from the method described in the previous system in that the factory ledger is made self-balancing. The general ledger accounts affected in this system are the same as those affected in the previous one, and are debited and credited in a similar manner. The accounts kept in the factory ledger are as follows:

(1) Raw Material
(2) Direct Labor
(3) Accounts with the items composing the indirect expenses
(4) Accounts with the various operating departments
(5) Part-Finished Stock
(6) Finished Stock
(7) General Ledger Account

(1) The Raw Material account is debited from the register of accounts payable with the total purchases, and with any material put back into stock, as obtained from the defective work report. It is credited with allowances and with the total raw material delivered to operating departments, as per the report of material delivered. The Raw

Material account is the controlling account for the raw stock records; and the balance of this account should agree with the total of the balances of the detailed stock records which represent the raw material inventory.

(2) The Direct Labor account is debited from the register of accounts payable with the total amount of direct labor, and is credited from the summary of time reports with the distribution of direct labor when same is charged to the various operating departments.

(3) The accounts representing items of indirect expense are debited from the register of accounts payable with the amount of expenditures incurred, and are credited with the distribution, as per the statement of factory expenditures, when this is charged to the various operating departments.

(4) The accounts with the various operating departments are debited:

(a) With the total amount of raw material as per the report of material delivered

(b) With the total amount of direct labor as per time report summary

(c) With the total amount of indirect expenses, as per the statement of factory expenditures

(d) With the total cost of any previous operations upon the article when it is transferred to one department from a previous department, as per a summary of department transfers, or with the total cost of finished stock put back into process to be completed

The department accounts are credited with the total cost of the transfers to a succeeding department, as per the department transfers, and with the total cost of defective work, as per the defective work report summary, at the time

this is charged to the Defective Work account. The department accounts are also credited with the total cost of finished parts, as per a summary showing the cost of these finished parts when they are transferred to the Part-Finished Stock account; and the final Operating Department account is credited with the total cost of the finished stock, as per summary, when it is charged to the Finished Stock account. The balance of the Operating Department account represents the cost of the work still in process in each operating department, and should agree with the detailed reports of production and costs in each department.

The Defective Work account is charged with the total cost of defective work from the defective work report summary, and is credited with the total cost of the raw material reclaimed and transferred to the raw material records, the balance of the account being treated as part of the indirect expenses.

(5) The Part-Finished Stock account is debited with the total cost of the part-finished stock, as per summary, and is credited with the total cost of the same when put back into operation to be completed, and also with the total cost of finished parts sold, as per the register of sales and costs. The balance of the account shows the total amount of part-finished stock on hand, and should agree with the detailed stock records of part-finished stock.

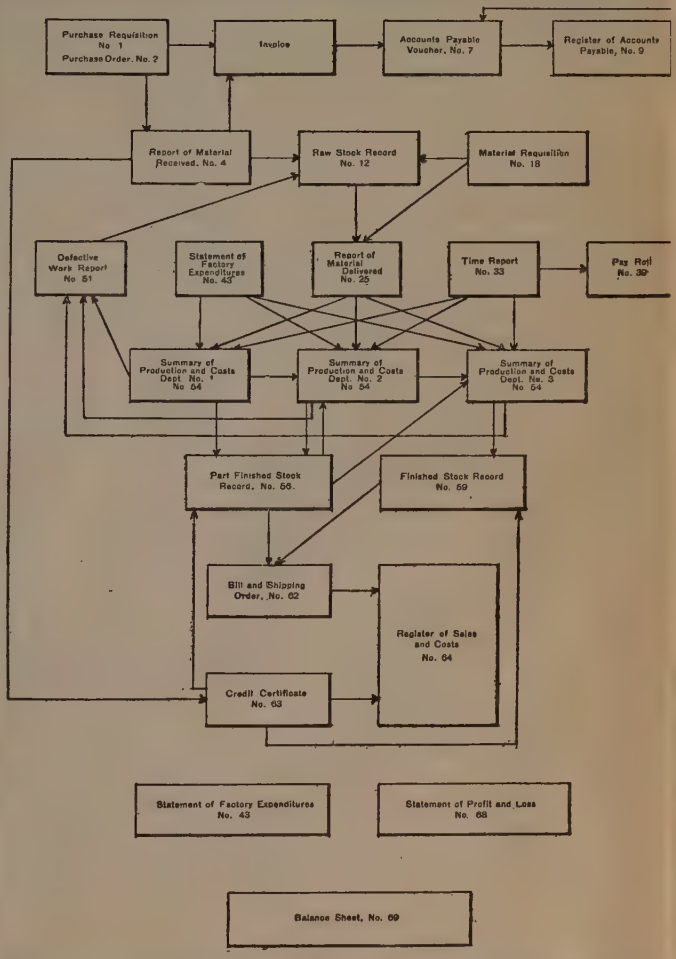
(6) The Finished Stock account is debited with the total cost of finished stock, as per summary, and is credited with the total amount of the cost of the sales, as per the register of sales and costs. The balance of the account represents the total amount of finished stock on hand, and should agree with the total of the balances of the detailed stock records.

(7) The General Ledger account is debited with the total cost of the sales, as per the register of sales and costs,

CHART OF

PRODUCT SYSTEM—PRODUCTI

GENERAL DESCRIPTION OF ENTRIES	DETAILED RECORDS AND FINAL STATEMENTS
Authorization and Purchase of Material and Supplies and Incurring Other Expenditures	
Receiving, Storing and Requisitioning Raw Material	
Raw Material and Supplies put into Operation and Compilation of Cost Data on the Departmental Summaries of Production and Costs. (1) Charging Raw Material, Direct Labor Cost and Indirect Expenses. (2) Transferring the Cumulative Cost from One Department to the Succeeding Department. (3) Reporting Defective Production.	
Transfer of Finished Parts and Finished Stock to the Stock Records. Transfer of Finished Parts into Operation.	
Shipment and Sale of Finished Stock or Part Finished Stock. Return of Finished Stock or Part Finished Stock. Entries upon Register of Sales and Costs.	
Final Statements.	


Purchase Requisition No. 1
Purchase Order. No. 2
Invoice
Accounts Payable Voucher, No. 7
Register of Accounts Payable, No. 9
Report of Material Received. No. 4
Raw Stock Record No. 12
Material Requisition No. 18
Defective Work Report No. 51
Statement of Factory Expenditures No. 43
Report of Material Delivered No. 25
Time Report No. 33
Pay Roll No. 39
Summary of Production and Costs Dept. No. 1 No. 54
Summary of Production and Costs Dept. No. 2 No. 54
Summary of Production and Costs Dept. No. 3 No. 54
Part Finished Stock Record. No. 58.
Finished Stock Record No. 59
Bill and Shipping Order, No. 62
Register of Sales and Costs No. 64
Credit Certificate No. 63
Statement of Factory Expenditures No. 43
Statement of Profit and Loss No. 68
Balance Sheet, No. 69

VE LABOR METHOD

METHOD OF CONTROL OF COST RECORDS		
POSTING MEDIUM	FACTORY LEDGER ACCOUNTS AFFECTED	GENERAL LEDGER ACCOUNTS AFFECTED
Register of Accounts Payable and Accounts Payable Vouchers Defective Work Report Summary	Dr. Raw Material Dr. Direct Labor Dr. Indirect Expense Accounts in detail Cr. General Ledger Dr. Raw Material Cr. Defective Work	Dr. Factory Ledger Cr. Accounts Payable
Report of Material Delivered Time Report Summary Statement of Factory Expenditures Summary of Department Transfers Defective Work Report Summary	Dr. Departments No. 1, No. 2 and No. 3 Cr. Raw Material Dr. Departments No. 1, No. 2 and No. 3 Cr. Direct Labor Dr. Departments No. 1, No. 2 and No. 3 Cr. Indirect Expense Accounts Dr. Departments No. 2 and No. 3 Cr. Departments No. 1 and No. 2 Dr. Defective Work Cr. Departments No. 1, No. 2 and No. 3	
Summary of Production and Costs of Dept. No. 3. Summary of Production and Costs of Dept. No. 1 and No. 2. Summary of Finished Parts put into operation to be completed.	Dr. Finished Stock Cr. Department No. 3 Dr. Part Finished Stock Cr. Departments No. 1 and No. 2 Dr. Departments No. 2 and No. 3 Cr. Part Finished Stock	
Register of Sales and Costs	Dr. General Ledger Cr. Finished Stock Cr. Part Finished Stock	Dr. Sales Classifications Cr. Factory Ledger

Statement of Factory Expenditures is prepared from the accounts in the Factory Ledger

Statement of Profit and Loss and Balance Sheet are prepared from the accounts in the General and Factory Ledgers

when same is credited to the Finished Stock account. The general ledger account is credited from the register of accounts payable with the total amount of factory charges, when these are debited to the accounts with raw material, direct labor and indirect expenses. The balance of the General Ledger account is generally a credit, and should agree with the debit balance of the Factory Ledger account which is kept in the general ledger.

CHAPTER XVII

PRODUCT SYSTEM BASED ON THE MACHINE OR PROCESS METHOD

This system is similar in some respects to that described in Chapter XV, so far as it relates to the machine or process method, the principal difference being that this is a product system, whereas the other is a special order system. Also its final costs are collated on a separate cost record, instead of on the production order and cost sheet. The present system is effective in factories where a standard line is manufactured, and where the operations are well defined in their relation to the product.

The operating hours, together with the costs relating to the machine or process, form the basis of the plan as described; but the basis need not necessarily be time, as this is not always practical. The total number of pounds or tons, or any other unit of measure, may be used, and the cost per unit for each operation ascertained. That is, the basis of a system of this kind may be either time, showing the cost per hour, or quantity, showing the cost per unit of measure.

The purchase requisition, purchase order, accounts payable voucher, register of accounts payable, report of material received, and raw stock record are the same in design for this system as for the systems previously described.

Production Order (Form 14)

The production order illustrated in this system may also be used as a material requisition; and for that reason the

material requisition and its summary are omitted from the forms described.

Another plan which may be followed where the product is absolutely standard is the use of an ordinary production order, in connection with a bill of material (such as shown in Form 22) instead of the material requisition.

The postings to the raw material records for material used can be made either from the production order or from the bill of material, depending on which is the more convenient; and the total cost of the material is charged on the cost records against the manufactured article or product for which the material was used.

Employees' Time Report (Form 27)

The time reports provide for the registering of production according to operation, and are applicable where the operator works on a machine, the labor cost being charged to the machine or process according to the production order number. In cases where the process cannot be identified with a particular order number, the time should be charged against the process and the name of the product.

The time reports should be summarized daily for entry on the pay-roll, and should be summarized weekly on the analysis of pay-roll.

Pay-Roll (Form 40)

This form is an ordinary record, used for pay-roll purposes only. It is designed so that the earnings of each employee may be entered daily.

Analysis of Pay-Roll (Form 36)

This form is used for analyzing the time records, and shows the productive labor according to time, operations, department, and order number or product classification. The

total labor cost is entered on the process card according to department and operation, and the total labor time, classified according to the various operations, is entered on the cost sheet of the article or order chargeable.

Analysis of Factory Expenditures (Form 41)

The "Analysis of Factory Expenditures" is made out from the accounts representing the indirect expenses which are kept in the factory ledger. Its purpose is to allocate the different items to their proper departments. Those classifications of the indirect expenses which cannot be charged to any particular department, or are not distributed to the process card records or power cost and distribution records of the various machines, may be summarized on this form and prorated over the various operating departments on the basis of productive labor cost, or productive labor hours.

Forms for Applying Costs

Process Card Record (Form 45)
Power Cost and Distribution (Form 46)

These forms are described fully in Chapter XV.

Production Report (Form 50)

This form should be made out daily or weekly (as the conditions in the plant may require) by each operating department according to order number or class of product. It shows the total production of each operating department according to operations.

The form also provides for costing the material of the production, the information being taken from either the factory order or the bill of material, if one is in use.

The total production for each operation is transferred at the end of the month to the cost sheet, under the caption

"Production," according to the article produced, and is entered in the proper column showing the production, according to operation or department.

Cost Sheet (Form 53)

This form is intended to be the final cost record of production. The costs may be kept by article or by product, a separate sheet being used for each classification.

The information under the caption "Production" and "Quantity" is taken, according to operations or departments, from the production report. The information under the caption "Hours" and "Minutes," is obtained from the analysis of pay-roll, according to operations.

The process rate per hour is obtained from the process card record. By multiplying the number of hours by the rate per hour, the process cost will be shown. The material cost will then be entered from the production order, and the total cost of the production shown. As these records are intended to be compiled departmentally, *i. e.*, by operating department, they should be summarized on the same form to obtain the complete cost of the production, which will then be transferred to the stock sheets of finished product.

Other Forms Employed

The following forms which have alreadv been described are necessary to complete the system:

Finished Stock Record (Form 59)
Part-Finished Stock (Form 56)
Inventory Test (Form 60)
Sales Sheet (Form 62)
Credit Certificate (Form 63)
Register of Sales and Costs (Form 64)
Profit and Loss Statement (Form 68)
Balance Sheet (Form 69)

Explanation of Chart and Summary of Entries

Subsidiary Forms and Records

The purchase requisition, purchase order, invoice, accounts payable voucher, register of accounts payable, report of material received, and raw stock record are used in the same manner as in the preceding system for the purpose of showing the authorization, purchase, receiving and storing of material and supplies, and the incurring of other expenditures.

The subsidiary records used for compiling the cost data are as follows:

(1) Production Order and Material Requisition
(2) Time Reports
(3) Analysis of Pay-Roll
(4) Analysis of Factory Expenditures
(5) Power Costs and Distribution
(6) Process Card Record
(7) Production Report
(8) Cost Sheet

The information upon the production order and material requisition is transferred to the cost sheet to show the cost of material going into process. The supplies are transferred either to the power costs and distribution or the process card record.

The time reports are entered upon the pay-roll for pay-roll purposes, and the analysis of the pay-roll is then attached to the accounts payable voucher for entry upon the register of accounts payable. The time reports are also entered upon the analysis of pay-roll, from which the information goes to either the power costs and distribution sheet or the process

card record. The productive labor time is entered upon the cost sheets.

The information upon the analysis of factory expenditures is transferred either to the process card records or to the power costs and distribution record, and after the power costs are distributed and entered upon the process card records, the information upon the process card records is transferred to the cost sheets.

The production report shows the amount of production, which is transferred to the cost sheets.

It will be seen that the cost sheet summarizes the elements of costs and production as follows:

(a) Material cost, from the production order

(b) The cost of productive labor and indirect expense, from the process card records

(c) The productive labor time on the article, from the analysis of pay-roll

(d) The quantity of the production, from the production report

The method of recording information relative to the transfer of finished articles and finished parts to the stock records, and also the method of transferring part-finished stock back into operation to be completed, has already been described. The method of recording shipments and sale of finished stock and part-finished stock, and also of any return of stock, has likewise been described.

Method of Control

The method of control of the cost records by the financial records is the same as used in the previous system, the general ledger accounts affected being the same. The accounts which are kept in the factory ledger are as follows:

(1) Raw Material and Supplies
(2) Direct Labor
(3) Accounts with the items composing the indirect expenses
(4) Power Cost
(5) Process Cost
(6) Work in Process
(7) Part-Finished Stock
(8) Finished Stock
(9) General ledger

(1) The Raw Material account is debited from the register of accounts payable with the total purchases, and is credited with allowances and with the total raw material and supplies delivered to operating departments, as per the production order summary. This summary shows the total material charged against the various articles upon the cost sheets, as per the summary of material requisitions, which in turn shows the supplies delivered and chargeable to the various machines and processes. The balance of the Raw Material account should agree with the total balances of the detailed stock records which represent raw material inventory.

(2) The Direct Labor account is debited from the register of accounts payable with the total amount of direct labor, and is credited from the analysis of pay-roll summary with the distribution of direct labor, when same is chargeable either to Power Cost or Process Cost account.

(3) The accounts representing the items of indirect expense are debited from the register of accounts payable with the amount of expenditures incurred, and are credited from the analysis of factory expenditures when expenditures are charged either to the Power Cost or Process Cost accounts.

(4) The Power Cost account is debited with

(a) The total supplies chargeable, as per summary of material requisitions

(b) The total direct labor chargeable, as per the analysis of pay-roll summary

(c) The total indirect expenses chargeable, as per the analysis of factory expenditures

The Power Cost account is credited with the distribution of the power cost when same is charged to the process cost account.

(5) The Process Cost account is debited with

(a) The total supplies chargeable, as per summary of material requisitions

(b) The total direct labor chargeable, as per analysis of pay-roll summary

(c) The total indirect expenses chargeable, as per analysis of factory expenditures

(d) The total cost of the power distributed, as per the power costs and distribution summary

The Process Cost account is credited with the total cost of the labor and indirect expenses distributed, chargeable to the Work in Process account.

(6) The Work in Process account is debited with

(a) The total cost of the material, as per the production order summary

(b) The process costs, as per the process card record summary

(c) The total cost of part-finished stock which has been put into operation to be completed

The Work in Process account is credited from the summary of cost sheets with the total costs of part-finished stock and finished stock when these are debited to the proper account. The balance of the Work in Process account should agree with the total balance of the cost sheets for

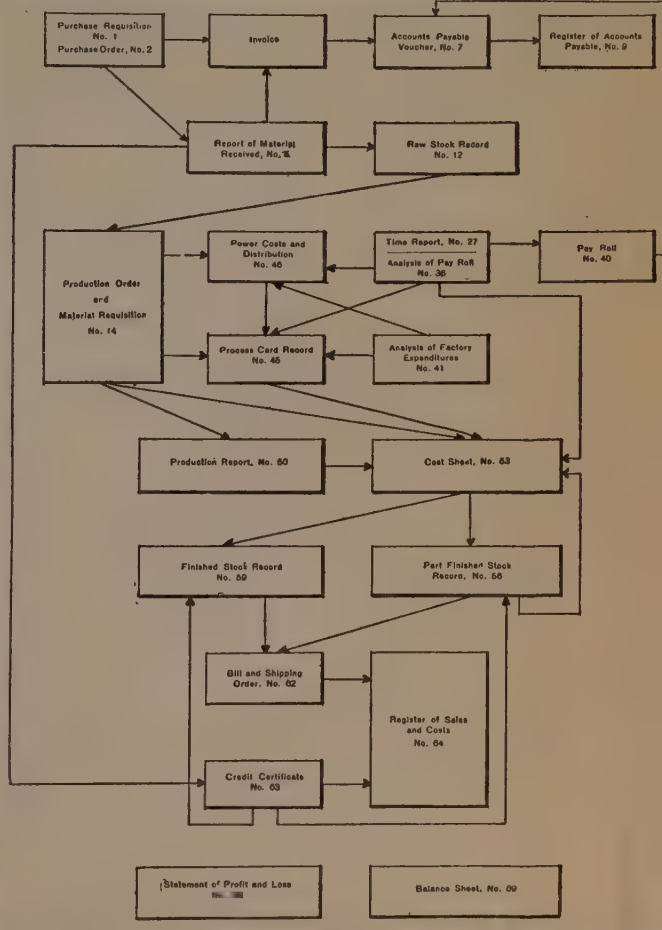
the articles or product still in process, and represents the inventory of the work in process.

The Part-Finished Stock, Finished Stock and General Ledger accounts are kept in the same manner as in the previous system and need no further explanation.

CHART OF

PRODUCT SYSTEM—MACHINE O

GENERAL DESCRIPTION OF ENTRIES	DETAILED RECORDS AND FINAL STATEMENTS
Authorization and Purchase of Material and Supplies and Incurring Other Expenditures	
Receiving and Storing Raw Material and Supplies.	
Raw Material put into Operation and Compilation of Cost Data on the Cost Sheet. (1) Charging Raw Material and Supplies. (2) Charging Productive Labor Cost and Time. (3) Analyzing and Charging Indirect Expenses (4) Compiling and Distributing Power Costs (5) Compiling and Distributing Process Costs.	
Transfer of Finished Parts and Finished Stock to the Stock Records. Transfer of Finished Parts into Operation.	
Shipment and Sale of Finished Stock or Part Finished Stock. Return of Finished Stock or Part Finished Stock. Entries upon Register of Sales and Costs.	
Final Statements.	


Purchase Requisition No. 1
Purchase Order, No. 2
Invoice
Accounts Payable Voucher, No. 7
Register of Accounts Payable, No. 9
Report of Material Received, No. 11
Raw Stock Record No. 12
Production Order and Material Requisition No. 14
Power Costs and Distribution No. 46
Time Report, No. 27
Analysis of Pay Roll No. 36
Pay Roll No. 40
Process Card Record No. 45
Analysis of Factory Expenditures No. 41
Production Report, No. 60
Cost Sheet, No. 63
Finished Stock Record No. 59
Part Finished Stock Record, No. 58
Bill and Shipping Order, No. 62
Register of Sales and Costs No. 64
Credit Certificate No. 63
Statement of Profit and Loss
Balance Sheet, No. 69

PROCESS METHOD

METHOD OF CONTROL OF COST RECORDS		
POSTING MEDIUM	FACTORY LEDGER ACCOUNTS AFFECTED	GENERAL LEDGER ACCOUNTS AFFECTED
Register of Accounts Payable and Accounts Payable Vouchers	Dr. Raw Material and Supplies. Dr. Direct Labor Dr. Indirect Expense Accounts in detail Cr. General Ledger	Dr. Factory Ledger Cr. Accounts Payable
Production Order Summary	Dr. Work in Process Cr. Raw Material and Supplies	
Summary of Material Requisitions	Dr. Process Costs Dr. Power Costs Cr. Raw Material and Supplies	
Analysis of Pay Roll Summary	Dr. Process Costs Dr. Power Costs Cr. Direct Labor	
Analysis of Factory Expenditures	Dr. Process Costs Dr. Power Costs Cr. Indirect Expense Accounts	
Power Cost and Distribution Summary	Dr. Process Costs Cr. Power Costs	
Process Card Record Summary	Dr. Work in Process Cr. Process Costs	
Summary of Cost Sheets of Finished Parts or Finished Stock	Dr. Part Finished Stock Dr. Finished Stock Cr. Work in Process	
Summary of Finished Parts put into Operation to be completed	Dr. Work in Process Cr. Part Finished Stock	
Register of Sales and Costs	Dr. General Ledger Cr. Finished Stock Cr. Part Finished Stock	Dr. Sales Classifications Cr. Factory Ledger Account
Statement of Profit and Loss and Balance Sheet are prepared from the accounts in the General and Factory Ledgers.		

FORMS

CHAPTER XVIII

FORMS RELATING TO MATERIAL

The forms which appear in the following pages are discussed in, and illustrate the text of the volume. As, however, they will at times be considered apart from the text, a few words of explanation may be useful.

In many cases, forms of the same class appear to be alike, save as to slight variations in ruling or arrangement. For the most part these differences are merely suggestive as showing the possibilities of detail changes. It is not well, however, to take their unimportance for granted, as a careful scrutiny will show that, in some cases at least, the variations are material, having the effect of adapting the form to some particular condition or kind of manufacture.

In designing forms it should be borne in mind that it is hardly possible to gather cost information for one purpose without at the same time procuring information that can be utilized in other ways. As an illustration, it would not be possible to obtain a list of the material used in manufacturing, chargeable to an order or process, without at the same time gathering information necessary for the stock records. When, therefore, by a few trifling additions to a form the information recorded upon it can be made available for all the purposes for which such information is needed, the saving in time and labor is obvious.

No standard size is given for the illustrative forms, nor is it necessary to have the exact number of lines or columns shown. These details will depend entirely on the nature and volume of the business for which the form is devised, and the character of the information to be preserved.

PURCHASE REQUISITION.

To._____ No. _____

(Purchasing Agent)

Please order the following articles: _____ 191___

FOR THE USE OF DEPT.	ORDER NO.	QUANTITY	DESCRIPTION	DATE WANTED	DATE ORDERED	PURCHASE ORDER NO.

Approved: _____ Signed: _____

Form 1. *Purchase Requisition.* (*See pages* 82, 187, 200.)

A. B. C. Co.
New York

PURCHASE ORDER.

No. _____
_____ 191__

To _____
Address _____
Terms _____
Ship to _____
Address _____
Via _____

Place our Order Number on all Invoices and Packages.
Send duplicate Invoices for each shipment.

TO BE SHIPPED ON OR BEFORE	DESCRIPTION	QUANTITY	RATE

You are hereby authorized to furnish the above material as stated. Acknowledge receipt of this order.

A. B. C. Co.
per _____

Form 2a. Purchase Order (original). (*See pages* 82, 187, 201.)

A. B. C. Co.
New York

PURCHASE ORDER.

No._____
_____ 190_____

To_____
Address_____
Terms_____
Place our Order Number on all Invoices and Packages.
Send duplicate Invoices for each shipment.

Ship to_____
Address_____
Via_____

TO BE SHIPPED ON OR BEFORE	DESCRIPTION	QUANTITY	RATE	AMOUNT	CHARGE TO

You are hereby authorized to furnish the above material as stated.
Acknowledge receipt of this order.

A. B. C. Co. Per_____

Form 2b. Purchase Order (duplicate). (*See pages* 82, 187, 201.)

REPORT OF MATERIAL RECEIVED No._____

Purchase Order No. _____

No. _____

Favor of _____

	ARTICLES	QUANTITY		
		GROSS	TARE	NET
	Date Received _____ Date of Invoice _____ Received by _____ Entered by _____			

Form 3a. Report of Material Received (original).
(*See pages* 83, 188, 201.)

REPORT OF MATERIAL RECEIVED. No._____

Purchase Order No._____

Favor of_____

ARTICLES	QUANTITY			RATE	COST	CHARGES	TOTAL COST
	GROSS	TARE	NET				

Date Received_____ Date of Invoice_____

Received by_____ Entered by_____

Form 3b. Report of Material Received (duplicate). (*See pages* 83, 188, 201.)

REPORT OF MATERIAL RECEIVED No._____

Purchase Order No._____ _____ 191_____

Name_____

ARTICLE		
LOT No.	DESCRIPTION	QUANTITY

Received by _____ Entered by _____

Form 4a. Report of Material Received (original).
(See pages 83, 215.)

REPORT OF MATERIAL RECEIVED

No._____

Purchase Order No._____ 191_____

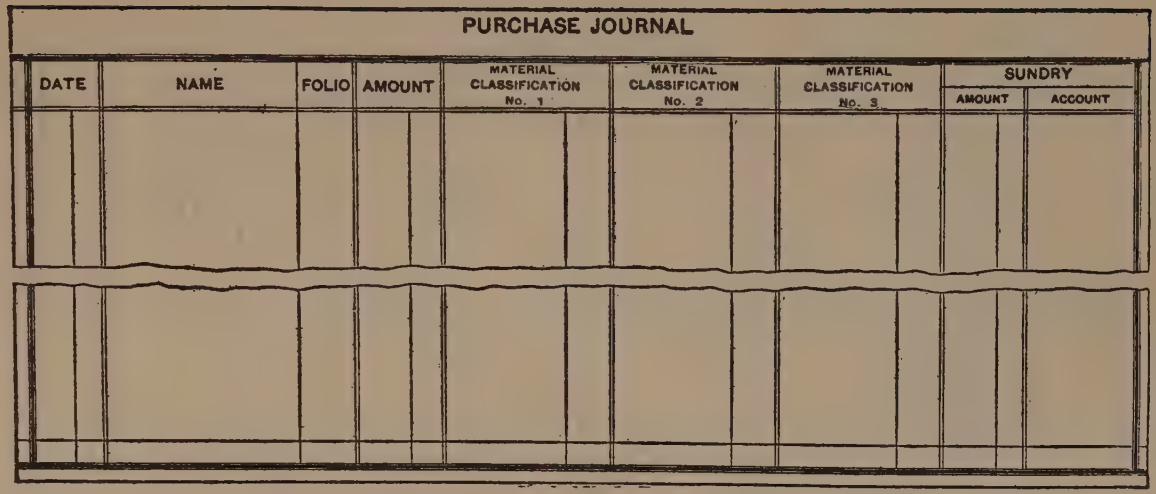
Name_____

ARTICLE			COST			
LOT NO.	DESCRIPTION	QUANTITY	INVOICE	CHARGES	TOTAL	RATE

CHARGES		FACTORY LEDGER			
DESCRIPTION	AMOUNT	ACCOUNT	DEPARTMENT	FOLIO	AMOUNT

Received by_____ Entered by_____

Form 4b. Report of Material Received (duplicate). (*See pages* 83, 215.)



PURCHASE JOURNAL

DATE	NAME	FOLIO	AMOUNT	MATERIAL CLASSIFICATION No. 1	MATERIAL CLASSIFICATION No. 2	MATERIAL CLASSIFICATION No. 3	SUNDRY	
							AMOUNT	ACCOUNT

Form 5. *Purchase Journal.* (*See pages* 102, 171, 174.)

PURCHASE JOURNAL

FOR THE MONTH OF _____ 191

DATE	NAME OF CREDITOR	FOLIO	TOTAL AMOUNT	RAW MATERIAL	SUPPLIES	REPAIRS AND MAINTENANCE	INSURANCE, TAXES AND WATER RENTS	FACTORY EXPENSES	SELLING EXPENSES	ADMINISTRATIVE EXPENSES	SUNDRY ACC'TS	AMOUNT

Form 6. Purchase Journal. (*See pages* 102, 181, 189.)

ACCOUNTS PAYABLE VOUCHER

No._____

Favor of_____ Date_____

DATE OF INVOICE	DESCRIPTION	AMOUNT OF INVOICE	DEDUCTIONS	AMOUNT PAYABLE

Approved for Payment _____

Correct _____

Form 7a. Accounts Payable Voucher (face).
(*See pages* 103, 201.)

ACCOUNTS PAYABLE VOUCHER

Date _____ No. _____

Favor of _____

Address _____

FACTORY LEDGER			GENERAL LEDGER		
DEPT.	A/C No.	AMOUNT	ACCOUNT		AMOUNT

Date Paid _____ Check No. _____

Amount of Check $ _____

Deductions $ _____

Amount of Invoice $ _____

CLASSIFICATION OF ACCOUNTS

OPERATING ACCOUNTS

1 Material
2 Direct Labor
3 Indirect Labor
4 Supervision
5 Supplies
6 Light, Heat and Power
7 Freight, Express and Cartage
8 Maintenance
9 Incidentals
10 Insurance
11 Taxes
12 Telegraphing and Telephoning
13 Postage, Printing and Stationery
14 Salaries
15 Depreciation
16 Advertising
17 Traveling Expenses
18 Commissions
19 Legal Expenses
20 Interest
21 Merchandise Discounts
22 Doubtful Accounts
23 Rent

DEPARTMENTS

A
B
C
D
E
F
G
H
I
J
K
L

Form 7b. Accounts Payable Voucher (reverse).
(*See pages* 103, 201.)

ACCOUNTS PAYABLE VOUCHER

No._____

Favor of_____ Date_____

DATE OF INVOICE	DESCRIPTION	AMOUNT OF INVOICE	DEDUCTIONS	AMOUNT PAYABLE

Approved for Payment _____ Correct _____

Form 8a. Accounts Payable Voucher (face).
(*See page* 103.)

ACCOUNTS PAYABLE VOUCHER

Date _____ No. _____
Favor of _____
Address _____

FACTORY ANALYSIS			GENERAL LEDGER		
ACCOUNT		AMOUNT	ACCOUNT		AMOUNT

Date Paid
Amount of Check $_____
Deductions $_____
Amount of Invoice $_____
Check No._____

CLASSIFICATION OF ACCOUNTS

FACTORY ANALYSIS

1 Material
2 Direct Labor
3 Indirect Labor
4 Supervision
5 Supplies
6 Light, Heat and Power
7 Maintenance
8 Insurance
9 Taxes and Water Rents
10 Salaries of Factory Clerks
11 Incidentals
12 Depreciation
13 Interest
14 Rent

Form 8b. Accounts Payable Voucher (reverse).
(*See page* 103.)

REGISTER OF ACCOUNTS PAYABLE.

CREDITS									
Accounts Payable						When and How Paid			
Date	Voucher No.	Favor of	Terms	Folio	Vouchers Payable	Date	Cheque No.	Bank	Amount

Form 9a. Register of Accounts Payable (left). (*See pages* 104, 202.)

FOR_____ 19____

DEBITS								
Miscellaneous Accounts			Operating Accounts			Property Accounts		
Name	Folio	Amount	Factory	Selling Expenses	Administrative Expenses	Machinery & Tools	Real Estate & Buildings	Furniture & Fixtures

Form 9b. Register of Accounts Payable (right). (*See pages* 104, 202.)

STOCK

Card No._____ Classification No._____

Maximum_____

Article_____ Minimum_____

DATE		SHEET	QUANTITY			COST	
MONTH	DAY	NUMBER	ORDERED	RECEIVED	DELIVERED	RATE	AMOUNT
		FORWARD					
		FORWARD					

Form 10. *Raw Material Stock Record.*

(*See pages* 84, 189, 202.)

STOCK SHEET
RAW MATERIAL

Article_____

Classification No._____
Maximum_____
Minimum_____
Location_____

ORDERED				RECEIVED			DELIVERED						BALANCE	
PURCHASE ORDER NO.	QUANTITY	TO BE RECEIVED		PURCHASE ORDER NO.	SHEET NO.	QUANTITY	SHEET NO.	QUANTITY	SHEET NO.	QUANTITY	SHEET NO.	QUANTITY	DATE	QUANTITY

Form 11. *Raw Material Stock Record.* (*See page* 84.)

STOCK
RAW MATERIAL

Article ..... Location .....

Classification No. .....
Maximum .....
Minimum .....

	ORDERED		RECEIVED					DELIVERED				BALANCE			RESERVED		AVAILABLE
	REFERENCE	QUANTITY	PURCHASE ORDER NO.	REPORT OF MATERIAL RECEIVED NO.	QUANTITY	RATE	AMOUNT	REFERENCE	QUANTITY	RATE	AMOUNT	QUANTITY	RATE	AMOUNT	FOR	QUANTITY	QUANTITY

Form 12. Raw Material Stock Record. (*See pages* 84, 216.)

CHAPTER XIX

PRODUCTION ORDERS AND REQUISITIONS

FACTORY ORDER

Factory Order No._____

To Foreman_____ Dept._____ Date_____

DATE WANTED	BILL OF MATERIAL OR MAT. REQ. No.	DESCRIPTION	QUANTITY

Completed_____ Signed_____Supt.

_____Foreman

Form 13. *Factory (or Production) Order.*
(*See pages* 87, 181, 217.)

PRODUCTION ORDER

To Foreman ..... Department

No. .....

Date .....

You are hereby authorized to manufacture the following;

REQUISITION FOR MATERIAL	QUANTITY	RATE	AMOUNT

Received by ..... Authorized by .....

Form 14. Factory (or Production) Order. (*See pages 87, 228.*)

PRODUCTION ORDER AND COST SHEET No. _____

_____ Department _____ 19

Date Wanted _____ 19

Complete _____ 19

Signed _____

You are hereby authorized to manufacture the articles as stated.

_____

(Superintendent)

QUANTITY	DESCRIPTION	DIAGRAM

Form 15a. Production Order and Cost Sheet (original). (*See pages 87, 190.*)

PRODUCTION ORDER AND COST SHEET No. _____

_____ Department _____ 19

Date Wanted _____ 19
Complete _____ 19
Signed _____

You are hereby authorized to manufacture the articles as stated.

_____
(Superintendent)

QUANTITY	DESCRIPTION	DIAGRAM

MATERIAL				LABOR					SUMMARY	
QUAN.	DESCRIPTION	RATE	AMOUNT	DATE	WORKMAN OR OPERATION	UNITS	RATE	AMOUNT	ANALYSIS	AMOUNT
									Material Cost	
									Labor Cost	
									Indirect %	
									Total Cost	
									Rate	
TOTAL MATERIAL				TOTAL LABOR						

Form 15b. Production Order and Cost Sheet (duplicate). (*See pages* 87, 192.)

To _____ Date Completed _____	PRODUCTION ORDER & COSTS	Order No. _____ Date Issued _____ Date Wanted _____
DESCRIPTION		

Form 16a. Production Order and Cost Sheet (original). (*See pages* 87, 202.)

To.....
Date Completed.....

PRODUCTION ORDER AND COSTS

Order No.....
Date Issued.....
Date Wanted.....

DESCRIPTION

DEPT.	OPERATIONS									
	NO.1	NO.2	NO.3	NO.4	NO.5	NO.6	NO.7	NO.8	NO.9	NO.10
TOTAL TIME										
COST PER HOUR										
PROCESS COST										

DEPT.	MATERIAL USED				SUMMARY	
	DESCRIPTION	QUANTITY	PRICE	AMOUNT	ANALYSIS	AMOUNT
					Material Process Cost Total Cost Quantity Price Selling Price Gross Profit	

Form 16b. Production Order and Cost Sheet (duplicate). (*See pages 87, 202, 208.*)

FACTORY ORDER

No._____

To Foreman_____ Department Date_____

You are hereby authorized to manufacture the following

	MATERIAL	QUANTITY	RATE	AMOUNT

Received by

Authorized by

Form 17a. Factory or Production Order (original). *(See page 87.)*

FACTORY ORDER No._____

To Foreman_____ Department Date_____

You are hereby authorized to manufacture the following

	MATERIAL	QUANTITY	RATE	AMOUNT

Received by _____ Authorized by _____

	DATE		PRODUCTION				COST		LABOR					MATERIAL
	MONTH	DAY	ARTICLE	MADE	DEFECTIVE	GOOD	RATE	AMOUNT	CLOCK NO.	OPERATOR	HOURS	RATE	AMOUNT	AMOUNT

Form 17b. Factory or Production Order (duplicate). (*See page 87.*)

MATERIAL REQUISITION

Department_____ Date_____ No._____

ORDER No. OR PRODUCT CHARGEABLE	QUANTITY	DESCRIPTION

Received by_____ Signed_____

Form 18. Material Requisition. (*See pages 89, 217.*)

MATERIAL REQUISITION No._____

_____Department Date_____

DESCRIPTION				CHARGE		
ARTICLE	SIZE	WEIGHT	COUNT	ORDER NO.	RATE	AMOUNT

Received by: _____ Approved by: _____

Form 19. *Material Requisition.* (*See pages* 89, 190, 203.)

MATERIAL REQUISITION No._____

Department _____ Date _____ 19____

CLASSIFICATION No.	DESCRIPTION	QUANTITY	RATE	AMOUNT

Form. 20. Material Requisition. (*See pages* 89, 174.)

MATERIAL REQUISITION No._____

_____ Department Date_____

USED FOR			DESCRIPTION				COST	
ORDER No.	MACHINE No.	PROCESS	ARTICLE	SIZE	WEIGHT	AMT.	RATE	AMOUNT

Received by _____ Approved by _____

Form 21. Material Requisition. (*See page 89.*)

No._____ **BILL OF MATERIAL** Order No._____

Dept._____ Date_____191____

COST DEPT.:

The following goods have been requisitioned from Storeroom No._____, or ordered purchased for use in Department and for order named above.

Date Wanted_____ Approved_____ Signed_____

N. B.—In case more stock is drawn than used, return to stores, note in "Over" column and report on proper form. In case of partial deliveries receiver will date and initial each delivery.

QUANTITY	ARTICLE	PART NUMBER	PURCHASE ORDER No.	DELIVERIES		OVERS	OFFICE USE ONLY	
				DATE	INITIAL		COST	AMOUNT

Form 22. Bill of Material. (*See page* 90.)

BILL OF MATERIAL

Required for_____ Date_____

Order No._____

CLASSIFICATION NO.	ARTICLE	QUANTITY	RATE	AMOUNT

Approved by:_____ Ordered by: _____

Form 23. Bill of Material. *(See pages 90, 182.)*

SUMMARY OF MATERIAL REQUISITIONS

For the period ending _____ 19

DEPT. A						DEPT. B						DEPT. C					
CLASSIFICATION NO. 1		NO. 2		NO. 3		NO. 1		NO. 2		NO. 3		NO. 1		NO. 2		NO. 3	
NO.	AMOUNT	NO.	AMOUNT	NO.	AMOUNT	NO.	AMOUNT	NO.	AMOUNT	NO.	AMOUNT	NO.	AMOUNT	NO.	AMOUNT	NO.	AMOUNT

Form 24. Summary of Material Requisitions (Report of Material Delivered).
(See pages 106, 174.)

REPORT OF MATERIAL DELIVERED

No._____

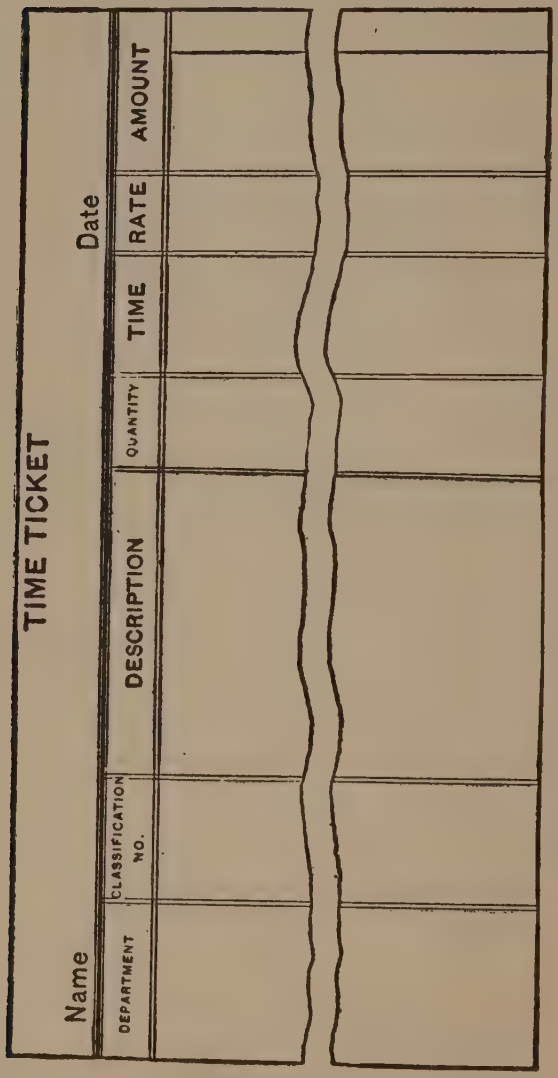
_____ Department

Date_____

	ORDER NO.	PRODUCT CHARGEABLE	ARTICLE	QUANTITY	RATE	AMOUNT	

Approved:_____ Correct:_____

Form 25. Report of Material Delivered. (*See pages* 106, 190, 203, 217.)



Form 26. Daily Time Report. (*See pages* 95, 175, 182.)

TIME REPORT

_____ Department Date_____

Name_____ Clock No. _____

Occupation_____ Order No. _____

PRODUCTION					TIME			COST		CHARGE		
SECTION No.	OPERATION	MADE	DEFECTIVE	GOOD	BEGUN	FINISHED	HOURS	RATE	AMOUNT	ORDER No.	MACHINE No.	PROCESS

NOTE: State the correct time engaged on each section.
Use a separate sheet for each order.
Deposit this report in the box provided for that purpose.

Approved_____

Form 27. Daily Time Report. (*See pages* 96, 229.)

TIME REPORT

Department _____ Week ending _____ 19____

Name _____ Clock No. _____

Occupation _____ Machine No. _____ Operation _____

ORDER NO.	OPERATION	MON.	TUES.	WED.	THURS.	FRI.	SAT.	TOTAL	RATE		AMOUNT	

Quantity O.K. Price O.K. Amount O.K.

Form 28. Weekly Time Report. (*See page* 96.)

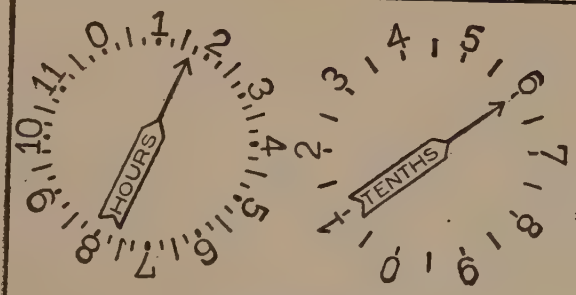
TIME REPORT

Name _____ _____ Department Date _____
Occupation _____ Clock No. _____
Room _____

ORDER NO.	DESCRIPTION	QUANTITY	TIME	RATE	AMOUNT	MATERIAL COST			
						DESCRIPTION	WEIGHT	RATE	AMOUNT

Quantity O.K. Price O.K. Amount O.K.

Form 29. Daily Time Report. (*See page 96.*)



TIME EMPLOYED

COMMENCED

Date

Order No. | Dept. No.

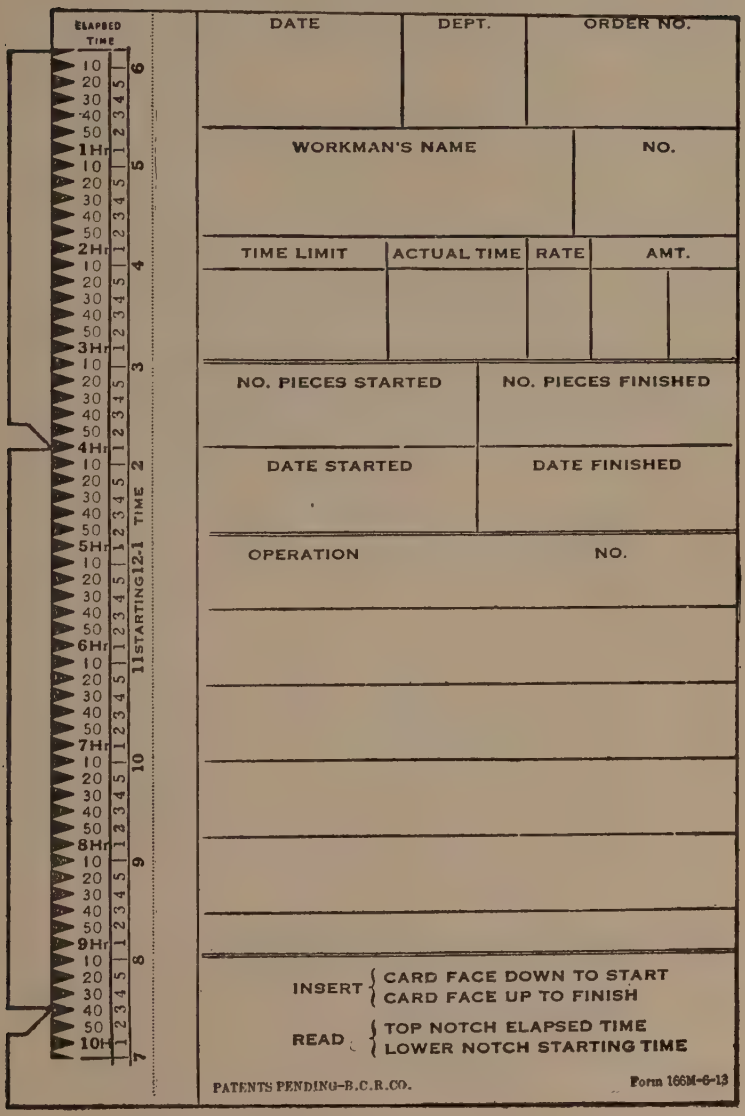
Machine No.

Workman No.

Boring	Drilling	Grinding	Planing	Tapping	Time Allowed
Chipping	Facing	Milling	Roughing	Threading	Premium Credit
Cutting Off	Filing	Mounting	Shaping	Turning	Foreman

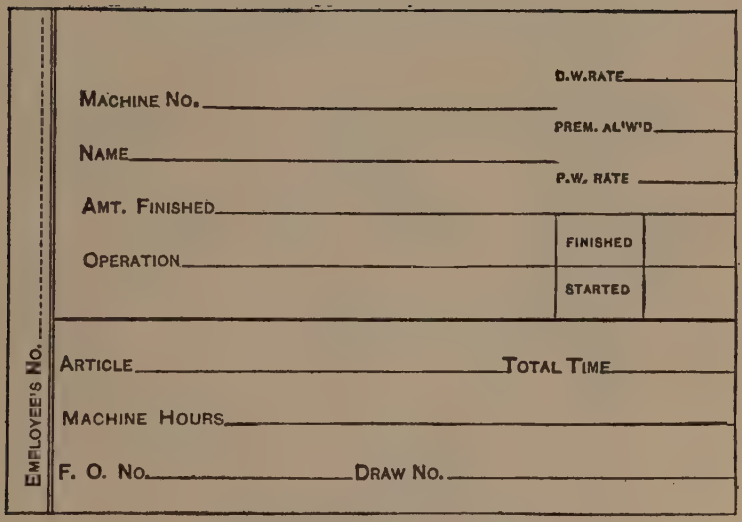
Quantity_____ Total Time_____ Rate_____ Cost_____

Form 30. Daily Time Record. (*See pages* 96, 191, 204.)

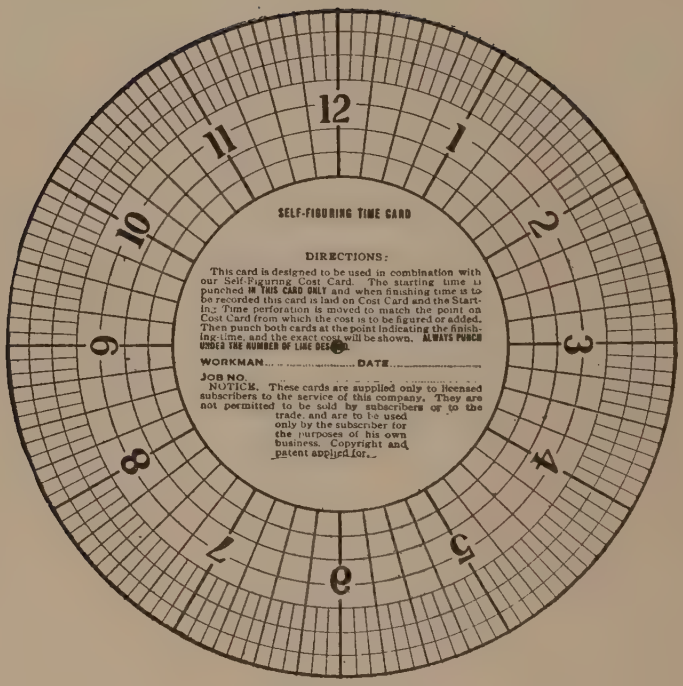


Form 31. Daily Time Record. (*See page 97.*)

Beading														
Bending														
Caning														
Cleaning														
Erecting														
Framing														
Gluing														
Nailing														
Panelling														
Patterns														
Ribbing														
Repairs														

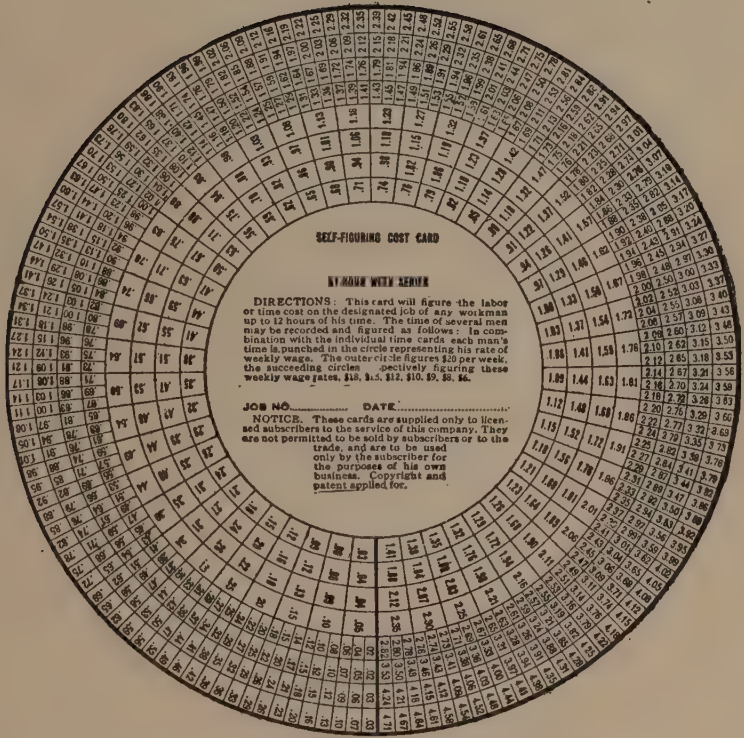


Form 33. Daily Time Record. (*See page 97.*)


12
1
2
3
4
5
6
7
8
9
10
11
SELF-FIGURING TIME CARD
DIRECTIONS:
This card is designed to be used in combination with our Self-Figuring Cost Card. The starting time is punched IN THIS CARD ONLY and when finishing time is to be recorded this card is laid on Cost Card and the Starting Time perforation is moved to match the point on Cost Card from which the cost is to be figured or added. Then punch both cards at the point indicating the finishing time, and the exact cost will be shown. ALWAYS PUNCH UNDER THE NUMBER OF LINE DESIRED.
WORKMAN..... DATE.....
JOB NO.
NOTICE. These cards are supplied only to licensed subscribers to the service of this company. They are not permitted to be sold by subscribers or to the trade, and are to be used only by the subscriber for the purposes of his own business. Copyright and patent applied for.

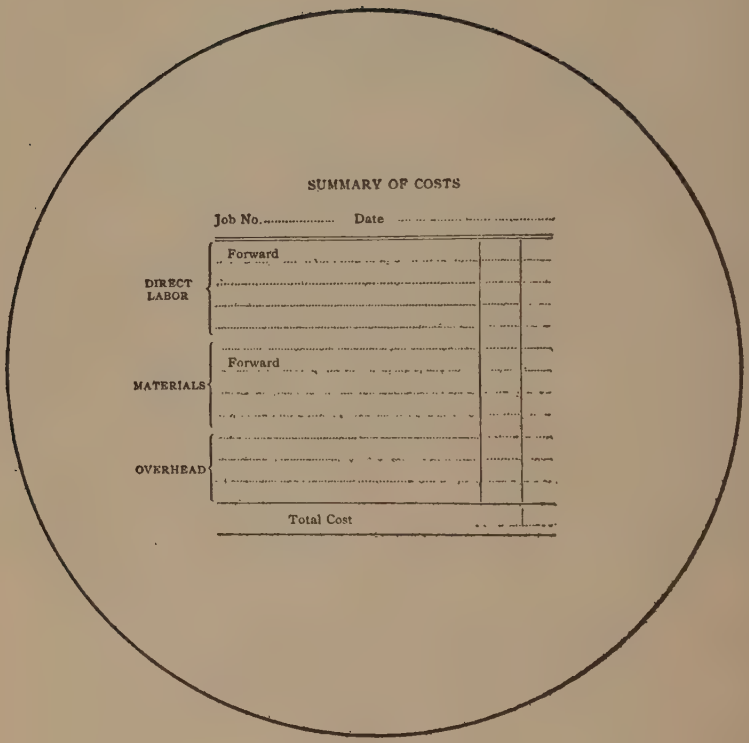
Form 34a. Self-Figuring Time Card.

(*See page* 98.)


SELF-FIGURING COST CARD
BY HOUR WITH SERVICE
DIRECTIONS: This card will figure the labor or time cost on the designated job of any workman up to 12 hours of his time. The time of several men may be recorded and figured as follows: In combination with the individual time cards each man's time is punched in the circle representing his rate of weekly wage. The outer circle figures $20 per week, the succeeding circles respectively figuring these weekly wage rates, $18, $15, $12, $10, $9, $8, $6.
JOB NO.
DATE
NOTICE. These cards are supplied only to licensed subscribers to the service of this company. They are not permitted to be sold by subscribers or to the trade, and are to be used only by the subscriber for the purposes of his own business. Copyright and patent applied for.

Form 34b. Self-Figuring Cost Card (face).

(*See page 98.*)



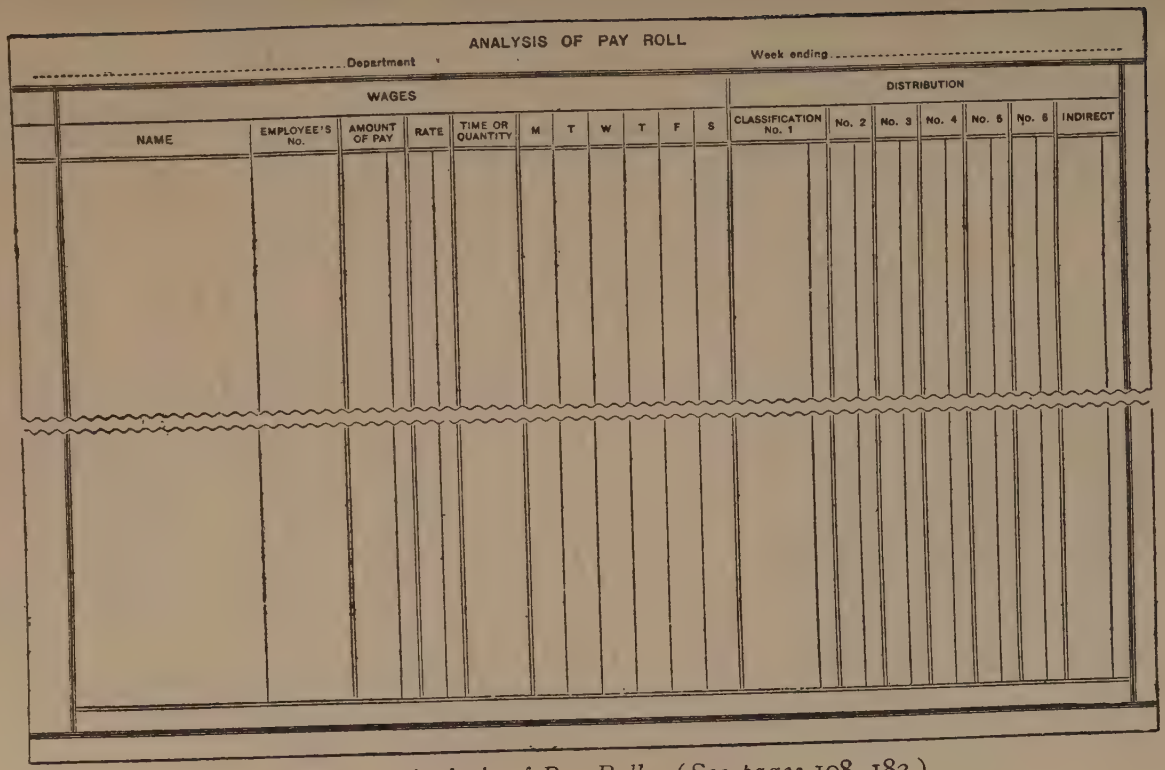
SUMMARY OF COSTS

Job No. ..... Date .....

DIRECT LABOR	Forward		
MATERIALS	Forward		
OVERHEAD			
	Total Cost		

Form 34c. Self-Figuring Cost Card (reverse).

(*See page* 98.)



ANALYSIS OF PAY ROLL

Department ..... Week ending .....

WAGES											DISTRIBUTION						
NAME	EMPLOYEE'S No.	AMOUNT OF PAY	RATE	TIME OR QUANTITY	M	T	W	T	F	S	CLASSIFICATION No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	INDIRECT

Form 35. *Analysis of Pay-Roll.* (*See pages* 108, 182.)

Operation

ANALYSIS OF PAY ROLL

Order No. Month of 19

DATE	EMPLOYEE'S NO.		EMPLOYEE'S NO.		EMPLOYEE'S NO.		EMPLOYEE'S NO.		EMPLOYEE'S NO.		TOTAL	
	HOURS	MINUTES	HOURS	MINUTES	HOURS	MINUTES	HOURS	MINUTES	HOURS	MINUTES	HOURS	MINUTES
TOTAL												
RATE												
AMOUNT												

Form 36. Analysis of Pay-Roll. (*See pages* 108, 229.)

PAY ROLL Week ending ..... 19.....

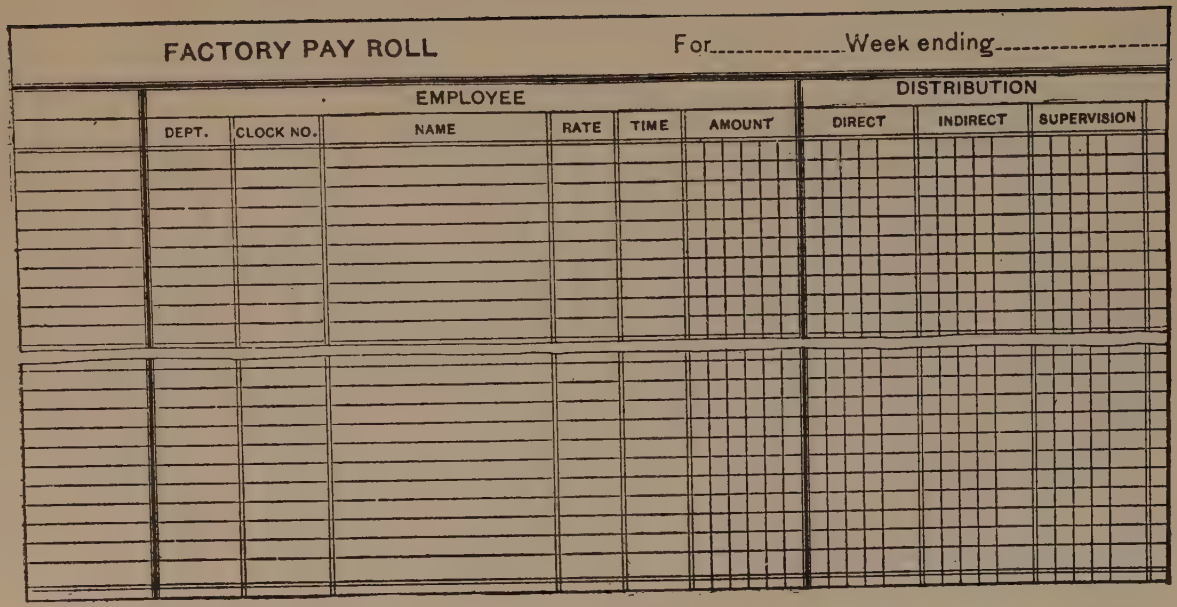
NAME	MON.	TUES.	WED.	THU.	FRI.	SAT.	SUN.	TOTAL	OPERATING DEPARTMENTS												SALARIES		CUPOLA	FOREMEN	GENERAL OPERATING EXPENSES			
									DIRECT	INDIRECT	DIRECT	INDIRECT	DIRECT	INDIRECT	DIRECT	INDIRECT	DIRECT	INDIRECT	DIRECT	INDIRECT	OFFICERS & OFFICE	SALESMEN			POWER	GENERAL SUPERVISION	SHIPPING	CLERKS

Form 37. Pay-Roll. (*See page* 106.)

PAY ROLL For period ending 191

	NO.	NAME	AMOUNT	OPERATING DEPARTMENT NO. 1	OPERATING DEPARTMENT NO. 2	OPERATING DEPARTMENT NO. 3	INDIRECT LABOR	SUPERVISION	OFFICE SALARY	

Form 38. Pay-Roll. (*See pages* 107, 172, 175.)



FACTORY PAY ROLL For_____ Week ending_____

	EMPLOYEE						DISTRIBUTION		
	DEPT.	CLOCK NO.	NAME	RATE	TIME	AMOUNT	DIRECT	INDIRECT	SUPERVISION

Form 39. Pay-Roll. (*See pages* 107, 191, 204, 218.)

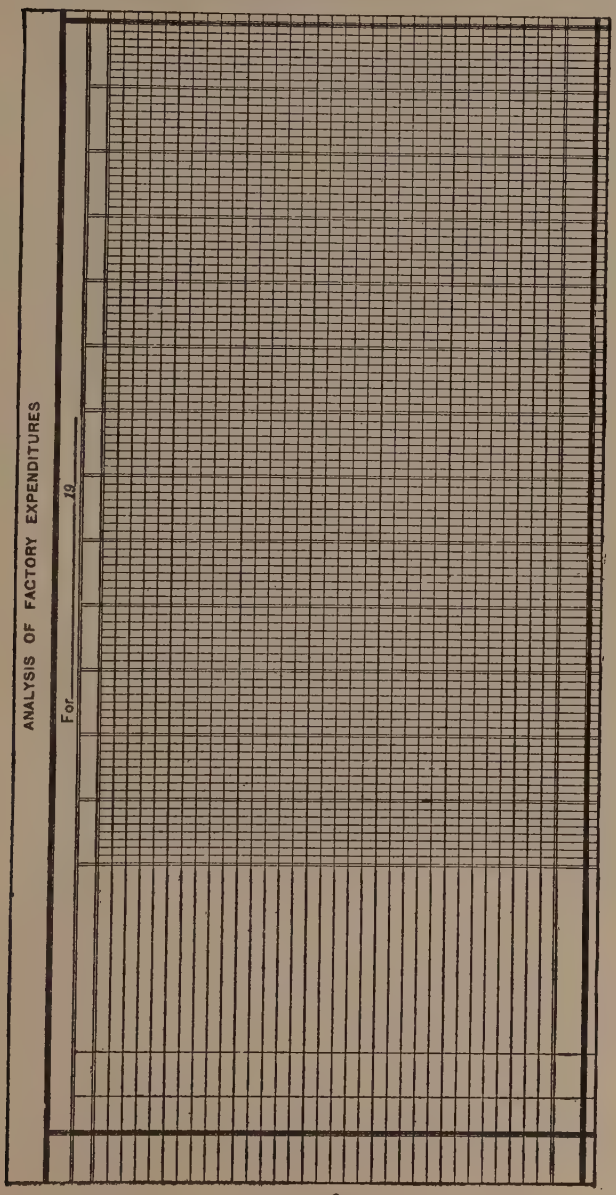
PAY ROLL

For the week ending _____ 191____.

	DEPARTMENT			AMOUNT OF PAY			DISTRIBUTION					
	No.	ROOM	CLOCK No.	EARNINGS	DEDUCTIONS	AMOUNT PAYABLE	MON.	TUES.	WED.	THUR.	FRI.	SAT.

Approved _____ Correct _____

Form 40. Pay-Roll. (*See pages* 107, 229.)



Form 41. Analysis of Factory Expenditures. (*See pages* 109, 204, 230.)

STATEMENT OF FACTOR

Accounts	A			B		
Direct:-						
Material	5	156	80	42	38	
Labor	4	018	38	292	94	
Total	9	175	18	335	32	
Indirect:-						
Labor		851	78	197	62	
Supervision		312	42	8	50	
Supplies		578	96	3	20	
Light, Heat and Power	2	890	40	37	48	
Freight, Express & Cartage (Inward)		22	44	3	06	
Maintenance	1	303	10	177	22	
Incidentals						
Depreciation		849	26			
General Operating Expenses		791	13	58	07	
Total	7	599	49	485	21	
Total Expenditures						
Material-Finished and in Process (beginning of period)						
Grand Total						
Cost of Sales						
Material-Finished and in Process (end of period)						

Store Room				Opera
Operations	Amount			Account
Inventory (beginning of period)	26	173	53	Superintendence
Purchases	19	162	53	General Labor
Total	45	336	16	Light, Heat and Power
Delivered to Operating Depts.	8	898	92	Insurance
Inventory of Raw Material at end of period	36	437	24	Taxes
				Freight, Express & Cartage (Inward)
				Factory Supplies
				Salaries of Factory Office Clerks
				Factory Office Supplies
				Incidentals
				Total

APPROVED:

Form 43a. Statement of Factory Expenditures (left). *(See pages 109, 220.)*

NOTE.—For Form 42 see page 292.

EXPENDITURES.

For the month of ---------- 19---

Departments C			D			E			F			G			Total		
	534	12	3	046	32							117	39	8	898	92
1	370	80	2	867	98	1	093	66	412	70		879	94	10	936	40
1	904	92	5	914	30	1	093	66	412	70		997	24	19	835	32
	536	54		253	94									1	839	86
	179	50		190	22		59	34	24	64		30	82		975	44
	71	52		126	72		103	96	292	84		86	16	1	328	42
	129	42		230	00		71	80	150	18		84	64	3	623	92
	10	62		18	86		5	88	2	46		7	02		70	34
	616	72	1	095	36		341	86	142	99		497	63	4	084	84
				64	10				45	90					110	00
	283	08		566	18		94	36	94	36				1	887	24
	269	64		564	87		214	64	80	69		173	18	2	152	12
2	097	02	3	110	25		956	74	863	97		959	50	10	072	18
														35	907	50
														49	444	86
														86	852	36
														35	790	06
														49	562	30

Expenses	Amount	Total	Distribution Departments	%	Amount
		174 32	No. A		791 13
		947 19	B		58 07
		131 10	C		269 65
		375 14	D		564 87
		245 83	E		214 64
		109 45	F		80 69
		16 21	G		173 18
		115 00			
		10 72			
		27 16			
		2 152 12	Total		2 152 12

CORRECT:

Form 43b. Statement of Factory Expenditures (right).
(See pages 109, 220.)

STATEMENT OF FACTORY EXPENDITURES

For the period ending _____ 19_____

ACCOUNTS	CURRENT MONTH		FISCAL YEAR TO DATE	
	AMOUNT	TOTAL	AMOUNT	TOTAL
Direct:				
Material				
Labor				
Indirect:				
Labor				
Supervision				
Supplies				
Light, Heat and Power				
Maintenance				
Insurance				
Taxes and Water Rents				
Salaries of Factory Clerks				
Incidentals				
Depreciation				
Interest				
Rent				
Total				
Inventory (Beginning of Period)				
Total				
Cost of goods sold				
Inventory (End of Period)				

Form 42. Statement of Factory Expenditures. (*See page* 109.)

STATEMENT OF FACTORY EXPENDITURES

Dated _____ 19_____

DISTRIBUTION	FOR THE CURRENT MONTH						FOR THE CURRENT FISCAL YEAR TO DATE					
ACCOUNTS	TOTAL	A	B	C	D	E	A	B	C	D	E	TOTAL
Direct:												
Material												
Labor												
Total												
Indirect:												
Labor												
Supervision												
Supplies												
Light, Heat and Power												
Freight, Express and Cartage (Inward)												
Maintenance												
Incidentals												
Depreciation												
General Operating Expense												
Total												
Percentage												
Total Expenditures												
Balance (beginning of period)												
Grand Total												
Cost of Sales												
All other Charges												
Inventory (end of period)												

Form 44a. Statement of Factory Expenditures (upper part). (*See page* III.)

STORE ROOM			OPERATING EXPENSES			DISTRIBUTION				
OPERATIONS	CURRENT MONTH	FISCAL YEAR TO DATE	ACCOUNTS	CURRENT MONTH	FISCAL YEAR TO DATE	DEPARTMENTS	CURRENT MONTH	%	FISCAL YEAR TO DATE	%
Inventory (beginning of period)			Superintendence			A				
			General Labor			B				
Purchases			Light, Heat and Power			C				
			Insurance			D				
Total			Taxes			E				
			Freight, Express and Cartage							
Delivered to Operating Depts.			Factory Supplies							
			Salaries of Factory and Office Clerks							
			Factory Office Supplies							
			Incidentals							
Inventory of Raw Material (end of period)			TOTAL			TOTAL				

Approved: _____ Correct: _____

Form 44b. Statement of Factory Expenditures (lower part). (*See page* 111.)

PROCESS CARD RECORD No. _____

_____ Department For the week ending _____

Machine No. _____ Operation _____

DISTRIBUTION								
Time								
Begun								
Finished								
Hours								
Idle								
Machine Costs								
Day Work								
Piece Work								
Supplies								
Power								
Floor Space Charges								
Maintenance								
Depreciation								
Insurance								
Dep't Indirect Expenses								
General Indirect Expenses								
TOTAL								
Cost per Hour								

Form 45. Process Card Record (Process and Machine Cost Record).
(*See pages* 111, 205.)

POWER COSTS & DISTRIBUTION

For the period_____ 191____

ANALYSIS	COST	DISTRIBUTION	DEPT.	HORSE POWER	RUNNING TIME	H. P. HOURS	POWER COST	
Rental Charge		Machine No. 1	A					
Depreciation		Machine No. 2	A					
License		Machine No. 3	A					
Inspection		Machine No. 4	B					
Insurance		Etc.	C					
Fuel			etc.					
Water								
Repairs								
Oil, Waste, etc.								
Engineer								
Firemen								
Incidentals								
Etc.								
TOTAL								

Horse-Power Hours
Horse-Power Distributed
Horse-Power Developed
Horse-Power Loss and Transmission
Cost per Horse-Power Hour

Form 46. Power Cost and Distribution (Process and Machine Cost Record). (*See pages* 111, 207.)

PRODUCTION REPORT No._____

_____ Department. Room_____ Date_____

ARTICLE			PRODUCTION		
ORDER NUMBER	KIND	OPERATION	MADE	DEFECTIVE	GOOD

Received by _____ Correct _____

Foreman

Form 47. Production Report or Summary. (*See page* 112.)

REPORT OF PRODUCTION AND COSTS

_____ Department No. _____

Operation _____ For the Week ending _____ 19 _____

PRODUCTION		COST		DISTRIBUTION		TIME						
ARTICLE	QUANTITY	RATE	AMOUNT	MATERIAL	PROCESS OR MACHINE COSTS	M.	T.	W.	T.	F.	S.	TOTAL

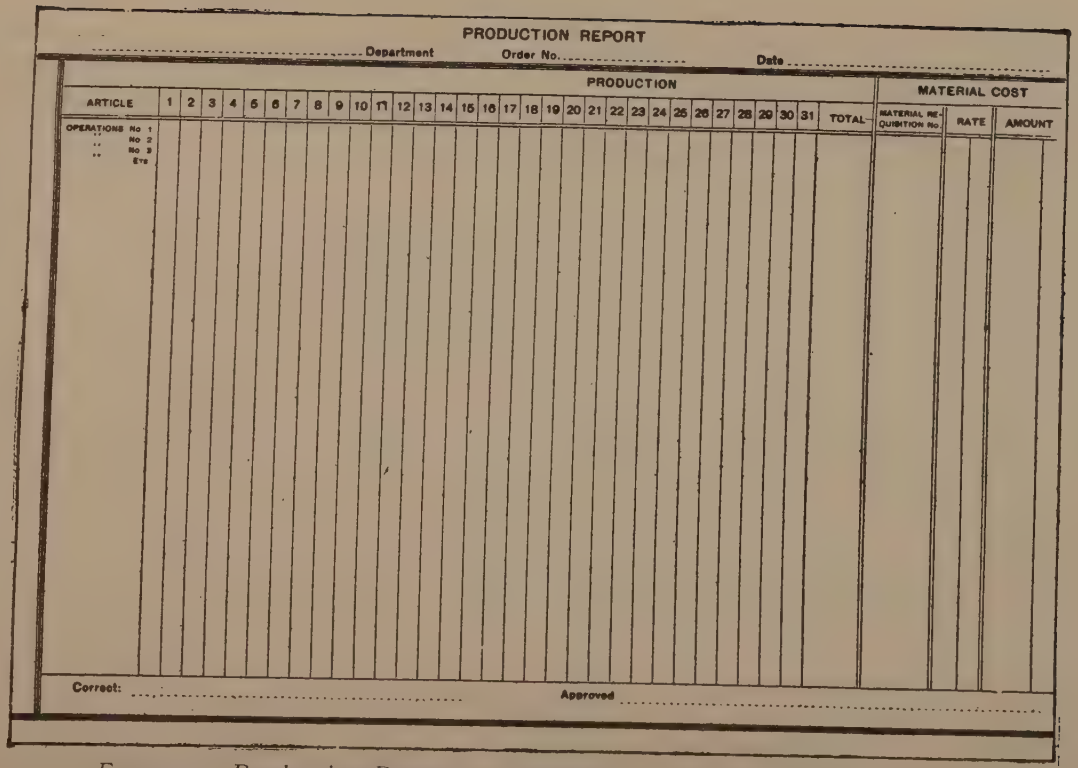
PRODUCTION REPORT

Department _____ For month of _____ 19__

ARTICLE	PRODUCTION																															MATERIAL COST			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	TOTAL	BILL OF MATERIAL NO.	RATE	AMOUNT	CLASSIFICATION TOTAL
Classification No. 1																																			
" No. 2																																			
" No. 3																																			
" Etc.																																			

Correct: _____ Approved: _____

Form 49. Production Report or Summary. (*See page* 112.)



PRODUCTION REPORT

Department ..... Order No. ..... Date .....

ARTICLE	PRODUCTION																													TOTAL	MATERIAL COST		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		MATERIAL REQUISITION No.	RATE	AMOUNT
OPERATIONS No 1																																			
" No 2																																			
" No 3																																			
" Etc																																			

Correct: ..... Approved .....

Form 50. Production Report or Summary. (*See pages* 113, 230.)

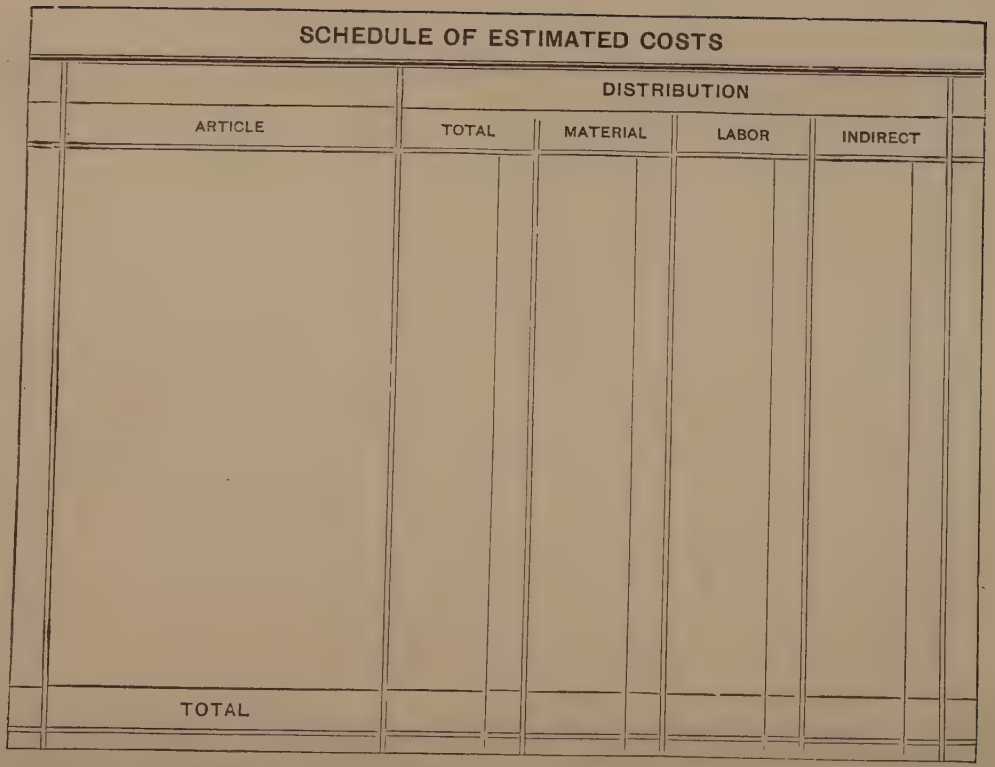
DEFECTIVE WORK REPORT

Department No._____ Date_____ 191_____

	EMP. No.	ORDER No.	ARTICLE	DEFECT	CAUSE	DISPOSITION	QUANTITY	DATE	AMOUNT	

Approved _____ Correct _____

Form 51. *Defective Work Report.* (*See pages* 113, 219.)



SCHEDULE OF ESTIMATED COSTS

ARTICLE	DISTRIBUTION			
	TOTAL	MATERIAL	LABOR	INDIRECT
TOTAL				

Form 52. Schedule of Estimated Costs (Cost Sheet). (*See pages* 114, 167, 173.)

COST SHEET

Article_____ No._____

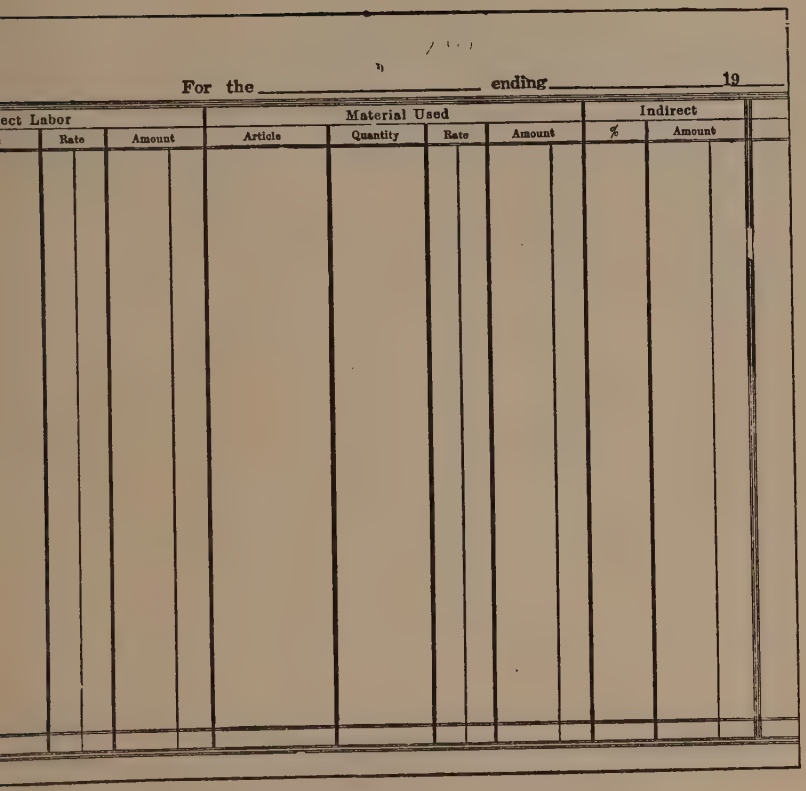
DATE		PRODUCTION		NO. 1			NO. 2			NO. 3			NO. 4			NO. 5		
				HRS.	MIN.	QUANTITY	HRS.	MIN.	QUANTITY	HRS.	MIN.	QUANTITY	HRS.	MIN.	QUANTITY	HRS.	MIN.	QUANTITY

Report of Production and Costs

	Dept.	Machines		Production				
	No.	In use	Average Production	Article	Quantity	Rate	Amount	Number of Employes

Form 55a. Cost Sheet (left). (*See page* 115.)

NOTE: For Form 54 see page 306.



For the _____ ending _____ 19

ect Labor			Material Used				Indirect	
	Rate	Amount	Article	Quantity	Rate	Amount	%	Amount

Form 55b. Cost Sheet (right). (*See page* 115.)

SUMMARY OF PRODUCTION AND COSTS

_____Department Week ending _____191_____.

ARTICLE	ORDER No.	COST											
		PREVIOUS OPERATIONS		MATERIAL		LABOR		INDIRECT		QUANTITY		TOTAL	
		RATE	AMOUNT	RATE	AMOUNT	RATE	AMOUNT	%	AMOUNT	No.	SIZE	RATE	AMOUNT

Form 54. Cost Sheet (Summary of Production and Costs). (*See pages* 115, 220.)

CHAPTER XXII

FORMS RELATING TO FINISHED PRODUCT, SALES AND FINANCIAL RECORDS

STOCK-FINISHED PRODUCTS AND PARTS

Maximum_____

Style_____ Minimum_____

Article_____

PRODUCED				USED OR SOLD		BALANCE	
DATE	QUANTITY	COST	AMOUNT	QUANTITY	AMOUNT	QUANTITY	AMOUNT

Form 56. Finished Stock Record (Record for Part-Finished and Finished Stock). *(See pages 116, 192.)*

FINISHED PART PRODUCT

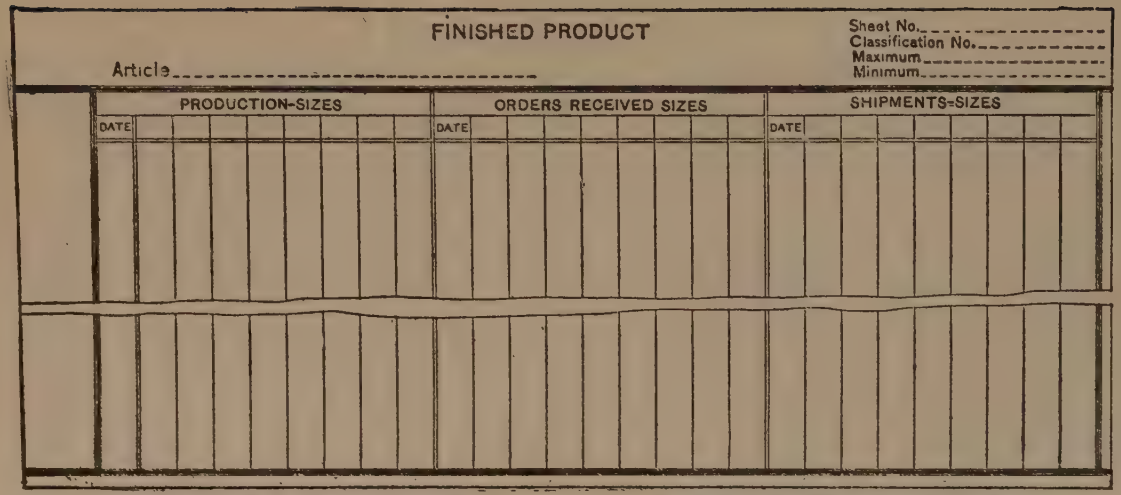
Sheet No. _____
Maximum _____
Minimum _____

Article _____ Department _____

PRODUCTION					DELIVERIES OR SALES					BALANCE		
DATE	REPORT NO.	QUANTITY	RATE	AMOUNT	DATE	SHEET NO.	QUANTITY	RATE	AMOUNT	QUANTITY	RATE	AMOUNT

Form 57. Finished Stock Record (Record for Part-Finished and Finished Stock).

(*See page 116.*)



Form 58. *Finished Stock Record* (*Record for Part-Finished and Finished Stock*).

(*See page* 116.)

STOCK—FINISHED PRODUCT

Article_____

Classification No._____
Maximum _____
Minimum _____
Bin No._____

	PRODUCTION			ORDERS		SALES				UNFILLED	BALANCE		
DATE	QUANTITY	RATE	AMOUNT	RECEIVED	CANCELLED	SHEET NO.	QUANTITY	RATE	AMOUNT	ORDERS	QUANTITY	RATE	AMOUNT

INVENTORY OF MATERIAL

Article _____ Location _____

Book Inventory _____ $ _____

Actual Count _____ $ _____

Difference _____ $ _____

Cause _____

Charge _____

Date taken _____ By _____

Form 60. Inventory Test. (*See pages* 91, 194.)

INVENTORY SHEET

	ARTICLE	QUANTITY	DISTRIBUTION							
			TOTAL		MATERIAL		LABOR		INDIRECT	
			RATE	AMOUNT	RATE	AMOUNT	RATE	AMOUNT	RATE	AMOUNT

Form 61. Inventory Sheet. (*See pages* 167, 173.)

Sold to_____

Address_____ New York_____

DESCRIPTION				SELLING PRICE	
	CLASSIFICATION	ARTICLE	QUANTITY	RATE	AMOUNT

No. of Pkgs._____	Shipped to_____	By Frt._____
Ship. Wt._____	Via_____	By Exp._____
Frt. Rate_____	B/L in Name of_____	Prepaid_____
Pkg. Chg._____	Date Shipped_____	Col._____

Form 62a. Shipping and Billing Record (original). (*See pages* 117, 193.)

Ship to_____

Address_____ New York_____

DESCRIPTION		
CLASSIFICATION	ARTICLE	QUANTITY

Form 62b. Shipping and Billing Record (duplicate).
(*See pages* 117, 193.)

				SELLING PRICE		COST PRICE		
	CLASSIFICAT ON	ARTICLE	QUANTITY	RATE	AMOUNT	RATE	AMOUNT	

Form 62c. Shipping and Billing Record (triplicate). (*See pages* 117, 193.)

Business _____
Salesman _____

THE A.B.C. CO.
NEW YORK
CREDIT CERTIFICATE

Date _____
No. _____

Favor of _____
Address _____

ARTICLE DESCRIPTION	QUANTITY	CREDIT ALLOWED RATE	CREDIT ALLOWED AMOUNT

Approved: _____ Correct: _____

Form 63a. Credit Certificate (original). (*See pages* 118, 193.)

THE A..B. C. CO.
NEW YORK

Date_____
No._____

Favor of_____ CREDIT CERTIFICATE
Address_____

ARTICLE		SELLING PRICE		COST PRICE	
DESCRIPTION	QUANTITY	RATE	AMOUNT	RATE	AMOUNT

Approved: _____ Correct: _____

Form 63b. Credit Certificate (duplicate). (*See pages* 118, 193.)

REGISTER OF SALES AND COSTS

For the period ending _____ 19_____

SALES									COST OF SALES				GROSS PROFIT	
DATE	No.	NAME	TERMS	FOLIO	ACCOUNTS RECEIVABLE	A	B	C	A	B	C	TOTAL	AMOUNT	%

Form 64. Register of Sales and Costs. (*See pages* 118, 183, 193.)

ANALYSIS OF COST OF SALES

ARTICLE	QUANTITY SOLD	MATERIAL		LABOR		INDIRECT		TOTAL	
		RATE	AMOUNT	RATE	AMOUNT	RATE	AMOUNT	RATE	AMOUNT

Form 65. *Register of Sales and Costs* (*Analysis of Cost of Sales*). (*See pages* 120, 168, 174.)

STATEMENT OF SALES AND SELLING COSTS Dated ..... 19....

SOURCE	SALES				SELLING COSTS				NET PROFIT	
	AMOUNT	COST	GROSS PROFIT	%	SALARIES OR COMMISSIONS	EXPENSES	TOTAL	%	AMOUNT	%

Approved. ..... Correct .....

Form 66. Salesmen's Costs. (*See page 132.*)

FACTORY LEDGER

Department
Account No
Sheet No

	DATE	MEMO	FOLIO		MATERIALS	LABOR	INDIRECT	TOTAL CHARGES	BALANCE	CREDITS		FOLIO	MEMO	DATE	

Form 67. Operating or Factory Ledger. (*See pages* 120, 219.)

STATEMENT OF PROFIT AND LOSS

DEPARTMENTS	SALES						GROSS PROFIT			
	Amount			Cost			Amount			
A	18	833	90	9	334	08	9	499	82	10
B	1	796	86	1	084	30		712	56	6
C	3	463	94	1	586	62	1	877	32	11
D	1	712	10		952	04		760	06	7
E	1	698	06	1	102	60		595	46	5
F		883	38		419	72		463	66	11
G	3	791	90	2	324	44	1	467	46	6
H	1	247	98		568	04		679	94	11
I	6	538	92	3	154	18	3	384	74	10
J	2	745	24	1	585	62	1	159	62	7
K		842	88		469	68		373	20	7
L		544	76		270	68		274	08	10
M	16	070	42	8	106	44	7	963	98	9
N		844	38		561	44		282	94	5
O	5	786	80	3	951	02	1	835	78	4
P		673	36		319	16		354	20	11
From Operating										
All other Income and Expenses										
From all Sources	67	474	88	35	790	06	31	684	82	8

Approved: _____

Form 68a. Monthly Profit and Loss Statement (left).
(*See pages* 130, 176, 198.)

For the *month* ending 19

EXPENSES												NET PROFIT			
Selling			%	Administrative			%	Total			%	Amount			%
3	654	10	39.1	1	508	06	16.2	5	162	16	55.3	4	337	66	46.7
	424	42			175	18			599	60			112	96	10.2
	621	04			256	54			877	58			999	74	63.0
	372	64			153	94			526	58			233	48	24.5
	421	40			178	08			609	48		–	14	02	– 1.3
	164	28			67	84			232	12			231	54	55.2
	909	64			375	82		1	285	46			182	00	7.8
	222	34			91	86			314	20			365	74	64.4
1	234	62			509	80		1	744	42		1	640	32	52.0
	624	44			256	08			880	52			279	10	17.8
	183	84			75	84			259	68			113	52	24.2
	105	94			43	72			149	66			124	42	46.0
3	172	88		1	309	08		4	481	96		3	482	02	42.9
	219	76			90	74			310	50		–	27	56	– 4.9
1	546	34			638	14		2	184	48		–	348	70	– 8.8
	124	92			51	68			176	60			177	60	55.7
14	012	60		5	782	40		19	795	00		11	889	82	33.2

Corrected

Form 68b. Monthly Profit and Loss Statement (right).
(*See pages* 130, 176, 198.)

COMPARATIVE

ASSETS	CURRENT MONTH		Increase or Decrease	
Accounts	Amount	Amount	Amount	Amount
CURRENT ASSETS				
Cash		6 008 43		1 010
Notes Receivable		2 145 —		— 100
Accounts Receivable		85 749 21		— 5 020
Raw Material		86 437 24		10 263
Material-Finished & In Process		49 562 30		4 042
DEFERRED CHARGES:				
Selling Expense		2 741 92		192
Administrative Expense		941 75		74
PROPERTY:				
Real Estate		60 000 —		
Buildings		120 475 90		
Machinery & Tools		175 418 07		1 675
Factory Furniture & Fixtures		8 020 94		345
Office Furniture & Fixtures		5 118 90		100
PATENTS, PATTERNS & DRAWINGS:				
Patents		7 500 —		
Patterns		12 645 —		145
Total Assets		572 764 66		12 629

Form 69a. Balance Sheet (left). (*See pages* 131, 199.)

BALANCE SHEET.

January, 31, 1909.

LIABILITIES	CURRENT MONTH		Increase or Decrease	
Accounts	Amount	Amount	Amount	Amount
CAPITAL STOCK		250 000 —		
CURRENT LIABILITIES:				
Notes Payable		37 500 —		— 2 500 —
Vouchers Payable		42 408 70		1 734 58
Pay Roll		4 721 95		642 81
RESERVE FUNDS:				
For Discounts		4 287 46		— 256 01
For Doubtful Accounts		500 —		
For Depreciation		2 400 —		200 —
For Taxes		572 91		572 91
For Interest		1 542 25		245 65
MORTGAGE		100 000 —		
SURPLUS		116 934 52		
NET PROFIT for the current fiscal year to date		11 889 82		11 889 82
Total Liabilities		572 764 66		12 629 76

Form 69b. Balance Sheet (right). (*See pages* 131, 199.)

No._____

Size_____ Class_____

Location_____ Building_____

Name_____ Room_____

Description_____

DATE		PURCHASED FROM	MATERIAL		LABOR		TOTAL COST	

Form 70a. Plant and Tool Record (face). (*See page* 133.)

REPAIRS								DEPRECIATION	
DATE		DESCRIPTION	LABOR		MATERIAL		TOTAL	%	AMOUNT

Form 70b. Plant and Tool Record (reverse). (*See page* 133.)

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